LOCATION ACEITUNAS PR

Established Series
Rev. RER
06/2002

ACEITUNAS SERIES

The Aceitunas series consists of deep, well drained, moderately permeable soils. They formed in fine textured alluvial and colluvial sediments. These soils are on footslopes, alluvial fans and valleys in coastal plains. Slopes range from 2 to 12 percent. Mean annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Paleudults

TYPICAL PEDON: Aceitunas clay in a sugarcane field.
(Colors are for moist soil)

Ap--0 to 7 inches; dark reddish brown (5YR 3/4) clay; moderate medium granular structure; firm, slightly sticky, plastic; many fine roots; many fine quartz grains; very strongly acid; abrupt smooth boundary. (5 to 10 inches thick.)

Bt1--7 to 15 inches; yellowish red (5YR 4/6) clay; moderate fine and medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; thin patchy clay films; many fine quartz grains; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bt2--15 to 23 inches; yellowish red (5YR 4/8) clay; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; thin patchy clay films; common fine quartz grains; common root channels; very strongly acid; clear wavy boundary. (6 to 10 inches thick)

Bt3--23 to 36 inches; yellowish red (5YR 4/8) clay; weak fine subangular blocky structure breaking to weak fine granular structure; friable slightly sticky, plastic; few fine roots; common fine quartz grains; common root channels; very strongly acid; clear wavy boundary. (10 to 15 inches thick)

Bt4--36 to 60 inches; red (2.5YR 4/8) clay; weak fine subangular blocky structure with shiny ped surfaces; firm, slightly sticky, plastic; few fine roots; many fine quartz grains; very strongly acid.

TYPE LOCATION: Noroeste SCD, Puerto Rico; 2.5 miles southeast of the town of Aquadilla. 2.3 kilometers on unnumbered paved road south of kilometer marker 123.5 of highway 2. 25 feet west of highway.
RANGE IN CHARACTERISTICS: The solum is more than 60 inches thick and the argillic horizon is more than 50 inches.

The A horizon has hue of 5YR or 2.5YR and value and chroma of 2 through 4.

The Bt horizon has hue of 5YR or 2.5YR values of 4 to 6 and chromas of 6 to 8. Structure ranges from weak, fine and medium to moderate fine and medium subangular blocky.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: The Aceitunas soils occur on gently to moderately sloping footslopes, alluvial fans and valleys associated with limestone hills with slope gradient from 2 to 12 percent. The regolith consists of fine textured sediments washed from the surrounding limestone hills. The climate is humid tropical. The average annual precipitation is 66 inches and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Tanama, Coto, and Matanzas series and the land type Limestone Outcrop, all of which are nonacid. The Tanama soils are neutral and shallow to hard limestone. The Coto soils are yellower and have oxic horizon that extends to more than 50 inches below the surface. The Matanzas soils are redder, shallower and have oxic horizons. Limestone Outcrop is a land type that consists of outcrops covering 75 percent or more of the surface area.

DRAINAGE AND PERMEABILITY: Well drained, medium runoff, moderate permeability.

USE AND VEGETATION: Most of the acreage is in sugarcane.

DISTRIBUTION AND EXTENT: Northwestern coastal plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Noroeste SCD, Puerto Rico, 1963.

REMARKS: These soils were formerly included in the Coto series.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 7 inches (Ap)

Argillic horizon - 7 to 60 inches (Bt1, Bt2, Bt3, and Bt4)

ADDITIONAL DATA: S72PR-16-1, NSSL

National Cooperative Soil Survey
U.S.A.

LOCATION AIBONITO PR

Established Series
Rev. BCD
06/2002

AIBONITO SERIES

The Aibonito series consists of very deep well drained, moderately permeable soils. The formed in material weathered from basic volcanic rocks. These moderately steep to steep soils are on ridgetops, and sideslopes in volcanic uplands. Slopes range from 12 to 40 percent. Mean annual precipitation is about 90 inches and the mean annual temperature is about 75 degrees F.

TAXONOMIC CLASS: Very-fine, mixed, semiactive, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Aibonito clay in a native pasture. (Colors are for moist soil)

Ap--0 to 7 inches, dark grayish brown (10YR 4/2) clay; moderate fine subangular blocky structure; very hard, friable, slightly sticky, plastic; many fine roots; very strongly acid; abrupt irregular boundary. (6 to 10 inches thick)

Bt1--7 to 11 inches, strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; extremely firm, sticky, plastic; brown (10YR 4/3) coatings on surfaces of peds; common fine roots; extremely acid; gradual smooth boundary. (3 to 6 inches thick)

Bt2--11 to 22 inches, strong brown (7.5YR 5/6) clay; common fine distinct yellowish red (5YR 4/6) mottles; strong coarse prismatic structure parting to moderate medium subangular blocky; extremely firm, sticky, plastic; brown (10YR 4/3) coatings on surfaces of peds; few fine roots restricted to surfaces of peds; few sand size grains; extremely acid; gradual wavy boundary. (8 to 14 inches)

Bt3--22 to 32 inches, strong brown (7.5YR 5/6) clay; common fine distinct red (2.5YR 4/6) mottles; strong coarse

prismatic structure parting to moderate medium subangular blocky; extremely firm, sticky, plastic; brown (10YR 4/3) coatings on surfaces of peds; few fine roots; few sand size grains; extremely acid; gradual wavy boundary. (8 to 12 inches thick)

Bt4--32 to 43 inches, strong brown (7.5YR 5/6) clay; many medium prominent yellowish brown (10YR 5/6) and red (2.5YR 4/6) mottles and few medium prominent white (10YR 8/1) mottles; weak medium subangular blocky structure; friable, slightly sticky, plastic; very few fine roots; thin patchy clay films; 30 percent of this horizon consists of saprolite; extremely acid; gradual wavy boundary. (8 to 14 inches thick)

C1--43 to 65 inches, red (2.5YR 4/6), strong brown (7.5YR 5/6) and white (10YR 8/1) clay; massive; friable, slightly sticky, plastic; saprolite; extremely acid; gradual wavy boundary. (15 to 30 inches thick)

C2--65 to 110 inches, red (2.5YR 4/6), strong brown (7.5YR 5/6) and white (10YR 8/1) silty clay; massive; friable, slightly sticky, slightly plastic; saprolite; extremely acid.

TYPE LOCATION: Torrecillas SCD, Puerto Rico; 6.2 kilometers south of town of Aibonito; 5 feet east of kilometer marker 6.2 of highway 162.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 33 to 56 inches. Thickness of the B horizons ranges from 27 to 46 inches. The soil is strongly to extremely acid. Organic carbon content in the upper inches of the argillic horizon ranges from 1.5 to 3.0 percent. Base saturation (by sum) is from 3 to 10 percent at 50 inches below the top of the argillic horizon. Cation exchange capacity ranges from 20 to 24 meg/100 grams of clay in the major part of the argillic horizon.

The A horizon has hue of 10YR or 7.5YR, value of 3 and 4, and chroma of 2 to 4. It has slightly sticky and plastic consistence.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 6 of 8. It is clay and has slightly sticky consistence.

The C horizon is variable in color and has slightly plastic to plastic consistence.

COMPETING SERIES: The Alonso and Daguey series are in the same family. The Alonso and Daguey soils have hue redder than 5YR.

GEOGRAPHIC SETTING: The Aibonito soils are sloping to steep soils on ridgetops and sideslopes of the dissected volcanic uplands with slope gradients from 12 to 40 percent. The soils formed in fine highly weathered residuum of volcanic rocks. The climate is humid tropical. The average annual precipitation is 90 inches. The mean annual temperature is 75 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Catalina, Comerio and Humatas, Los Guineos and Mucara series in addition to the competing Daguey series. The Catalina and Comerio soils are more highly weathered and occur in flatter, more stable surfaces. The Humatas and Los Guineos have higher CEC. The Mucara soils are shallow to the semiconsolidated basic volcanic rocks.

DRAINAGE AND PERMEABILITY: Well drained, runoff medium to rapid, permeability is moderate.

USE AND VEGETATION: Most of the acreage is in native grasses and shrubs and used for pasture. Small acreage is cultivated and used for growing of subsistence crops.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of minor content.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico (San Jual Soil Survey); 1972.

REMARKS: The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Orthoxic Tropohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED date was 4/87.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - 0 to 7 inches (Ap horizon)

Argillic horizon - 7 to 43 inches (Bt horizons)

ADDITIONAL DATA. Characterization data are available for the typical pedon, S59PR10-10, SSIR No. 12.

National Cooperative Soil Survey
U.S.A.

LOCATION ALMIRANTE PR

Established Series
Rev. RER
06/2002

ALMIRANTE SERIES

The Almirante series consists of deep, well drained, moderately permeable soils on coastal plains and valleys. They formed in clayey sediments of mixed origin. Slopes range from 2 to 12 percent. Mean annual precipitation is 65 inches and the mean annual temperature is 78 degrees F.

TAXONOMIC CLASS: Very-fine, kaolinitic, isohyperthermic Plinthic Hapludox

TYPICAL PEDON: Almirante clay - Pangolagrass
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; dark yellowish brown (10YR 4/4) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common quartz sand grains; common fine dark concretions; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bt--7 to 25 inches; strong brown (7.5YR 5/6) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few thin patchy clay films; few fine pores; common quartz sand grains; few fine dark concretions; common black stains on surfaces of peds; very strongly acid; clear smooth boundary. (12 to 20 inches thick)

Btv1--25 to 40 inches; brownish yellow (10YR 6/8) clay with common medium distinct dark red (10YR 3/6) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few thin patchy clay films; few fine dark concretions; few dark stains; few fine quartz sand grains; very strongly acid; 8 percent plinthite; gradual smooth boundary. (12 to 18 inches thick)

Btv2--40 to 60 inches; red (10R 3/6), brownish yellow (10YR 6/8) and light gray 5Y 7/1) clay; weak medium subangular blocky structure; firm, sticky, plastic; thin patchy clay films; few quartz sand grains; very strongly acid; 15 percent plinthite.
TYPE LOCATION: San Juan SCD, Puerto Rico; 40 feet north of kilometer marker 0.6, highway 694, township of Dorado.

RANGE IN CHARACTERISTICS: Argillic horizons are thicker than 60 inches. Depth to non-indurated plinthite ranges from 20 to 40 inches. The soil ranges from strongly through extremely acid.

The A horizon has hues of 10YR, 7.5YR, or 5YR, values of 3 or 4, and chroma of 2 through 4. The A horizon is sandy clay loam or clay.

The Bt and upper Btv horizons have colors in hues of 10YR, 7.5YR, 5YR, values of 4 through 6, and chroma of 4 through 8. The lower Btv horizon is mottled in shades of brown, red, and gray. Plinthite ranges from 5 to 20 percent by volume.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: The Almirante soils are in coastal plains and in valleys between the limestone hills (haystacks). Slope gradients range from 2 to 12 percent. The soils have formed in fine textured sediments of mixed origin. These are known locally as coastal plains clays or tertiary clays and are variegated with brown, red, gray and contain plinthite. The climate is humid tropical. The average annual precipitation is 65 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bayamon, Pina, Tanama, and Vega Alta soils, and the land type Limestone outcrops. The Bayamon and Pina soils also occupy similar positions in the landscape, but are red, more weathered and have oxic rather than argillic horizons. The Tanama soils have a solum which ranges from 12 to 20 inches in thickness underlain by hard limestone. The Vega Alta soils occupy similar positions in the coastal plains but have plinthite closer to the surface.

DRAINAGE AND PERMEABILITY: Well drained; slow to medium runoff; moderate permeability.

USE AND VEGETATION: Used for sugarcane, food crops, pineapple and grasses.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon: the zone from 0 to 7 inches (Ap horizon)

Argillic Horizon: the zone from 7 to 60 inches (Bt, Btv1, Btv2 horizons)

Plinthite: more than 5 percent in Btv1 and Btv2 horizons

ADDITIONAL DATA: Characterization Data for two pedons, S72PR-9-1 and S73PR-07-3, NSSL.

National Cooperative Soil Survey
U. S. A.

LOCATION BAJURA PR

Established Series
Rev. RER
06/2002

BAJURA SERIES

The Bajura series consists of deep poorly drained, slowly permeable soils on river flood plains. They formed in sediments of mixed origin. Slopes range from 0 to 2 percent. Mean annual precipitation is 84 inches and the mean annual temperature is 78 degrees F.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Vertic Endoaquolls

TYPICAL PEDON: Bajura clay - sugarcane
(Colors are for moist soil)

Ap--0 to 6 inches, very dark grayish brown (10YR 3/2) clay; massive; hard, firm, slightly sticky, plastic; many fine roots; common fine black concretions; few pressure faces; medium acid; clear smooth boundary. (4 to 8 inches thick)

Bw--6 to 12 inches, very dark grayish brown (2.5Y 3/2) clay, many medium distinct gray (N 6/) and few medium distinct reddish brown (5YR 4/4) mottles; weak fine and medium subangular blocky structure; very firm, sticky, plastic; common fine roots; common fine black concretions; few pressure faces; medium acid; gradual smooth boundary. (4 to 10 inches thick)

Bg1--12 to 32 inches, dark gray (N 4/) clay, many medium distinct dark greenish gray (5BG 4/1) and few medium distinct brown (7.5YR 4/4) mottles; weak medium angular blocky structure; very firm, sticky, plastic; few fine roots; few pressure faces; medium acid; gradual smooth boundary. (15 to 25 inches thick)

Bg2--32 to 60 inches, dark greenish gray (5BG 4/1) clay, few fine distinct brown (7.5YR 4/4) mottles; weak medium

angular blocky structure; very firm, sticky, plastic; few fine roots; few slickensides and pressure faces; medium acid.

TYPE LOCATION: Suroeste SCD, Puerto Rico; 2 miles northwest of the town of Cabo Rojo; 500 feet northeast on old railroad from kilometer marker 3.2 of highway 103. 50 feet north of old railroad.

RANGE IN CHARACTERISTICS: Solum thickness is more than 60 inches. The soil is medium acid and slightly acid throughout. The soil has cracks 1/2 to 2 inches wide to a depth of 30 inches during dry seasons in most years. Some polypedons are saline.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silty clay or clay.

The Bw horizon has hue of 2.5Y, value of 3 to 6, and chroma or 0 to 2. It is clay and has few to many mottles.

The Bg horizon has hue of 2.5Y to 5BG, value of 4 or 5, and chroma of 0 to 2. It is clay and has few to many mottles.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: The Bajura soils are nearly level soils on river flood plains with slopes of 0 to 2 percent. The soils formed on fine textures sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 84 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Coloso, Dique, Igualdad, Maunabo, Santoni and Toa soils all of which are on river flood plains. Coloso soils are somewhat poorly drained and lack cracks. Dique soils are well drained and lack cracks. Igualdad soils have clayey over sandy or sandy-skeletal particle-size control sections. Maunabo soils do not have shrink-swell properties. Santoni soils are calcareous. Toa soils are well drained and moderately well drained and have a mollic epipedon.

DRAINAGE AND PERMEABILITY: Poorly drained, slow run-off, slow permeability.

USE AND VEGETATION: Most of the acreage is planted to sugarcane but some areas are used for growing pasture.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent with about 13,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico. (San Juan Soil Survey Area), 1972.

REMARKS: These soils were formerly included with the Coloso series, poorly drained phase.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedons - zone from 0 to 6 inches (Ap horizons)

Vertic property - cracks and pressure faces and slickensides.

National Cooperative Soil Survey
U. S. A.

LOCATION BAYAMON PR

Established Series
Rev. GRB
08/1999

BAYAMON SERIES

The Bayamon series consists of very deep, well drained, very slowly permeable soils on coastal plains interspersed among limestone hills (haystacks or pipino hills). They formed in highly weathered fine-textured sediments of mixed origin. Slopes range from 2 to 12 percent. The mean annual precipitation is about 65 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Very-fine, kaolinitic, isohyperthermic Typic Hapludox

TYPICAL PEDON: Bayamon clay - cultivated. (Colors are for moist conditions.)

Ap--0 to 6 inches; dark reddish brown (5YR 3/3) clay; weak fine subangular blocky structure parting to moderate fine granular; friable, slightly sticky, slightly plastic; many fine roots; many fine quartz sand grains; very strongly acid; clear smooth boundary. (4 to 12 inches thick)

A/B--6 to 11 inches; red (2.5YR 4/6) and dark reddish brown (5YR 3/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; many fine roots; many fine quartz sand grains; very strongly acid; abrupt smooth boundary. (0 to 6 inches thick)

Bo1--11 to 20 inches; red (2.5YR 4/6) clay; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; common fine tubular and vesicular pores; common black coatings in old root channels; few fine iron concretions; common quartz sand grains; very strongly acid; gradual wavy boundary.

Bo2--20 to 33 inches; red (2.5YR 4/6) clay; weak very fine subangular blocky structure; firm, slightly sticky, plastic;

common fine tubular and vesicular pores; common fine quartz sand grains; few fine black sand-size particles; very strongly acid; gradual wavy boundary.

Bo3-33 to 47 inches; red (2.5YR 4/6) clay; weak, very fine subangular blocky structure; very friable, slightly sticky, plastic; few fine pores; few quartz sand grains; very few fine black sand-size particles; common fine yellow (10YR 7/6) masses of iron accumulations on ped surfaces and in old root channels; very strongly acid; gradual wavy boundary.

Bo4-47 to 61 inches, red (10R 4/6) clay; weak, very fine subangular blocky structure; very friable, slightly sticky, plastic; few fine pores; few quartz sand grains; very few fine black sand-size particles; common fine yellow (10YR 7/6) iron accumulations on ped surfaces and in old root channels; very strongly acid; clear wavy boundary.

Bo5-61 to 66 inches, dark red (10R 3/6) clay; weak medium subangular blocky structure parting to moderate fine subangular blocky; firm, slightly sticky, slightly plastic; common fine tubular and vesicular pores; common fine quartz sand grains; few fine concretions; very strongly acid.

TYPE LOCATION: Manati Municipio, Puerto Rico. Approximately 150 feet north of Kilometer marker 2.75 of highway 670. Manati topographic quadrangle; lat. 18 degrees 26 minutes 03 seconds N., long. 66 degrees 26 minutes 09 seconds W. PRD 1940.

RANGE IN CHARACTERISTICS: Thickness of the solum is more than 60 inches. Reaction is very strongly acid or strongly acid throughout. Quartz sand grains range from few to many throughout.

The A or Ap horizon has hue of 10R to 5YR, value of 3 or 4, and chroma of 3 or 4. Texture is sandy clay loam, clay loam, or clay. Iron concretions range from none to common.

The A/B horizon, where present, is a mix of the Ap and Bo horizons. It has hue of 2.5YR, value of 3 or 4, and chroma of 4 or 6; or there is no dominant color and is a mix of the colors of the Ap and Bo horizons. Texture is clay loam or clay.

The Bo horizon has hues of 10R or 2.5YR, value of 4 through 6, and chroma of 3 through 8. Iron concretions range from none to common in the upper part and generally decrease with depth. Redoximorphic accumulations as coatings on ped faces in shades of brown and yellow range from none to common in the lower horizons.

COMPETING SERIES: This is the Coto series in the same family. Coto soils are less strongly weathered and are strong brown in color in the middle and lower horizons.

GEOGRAPHIC SETTING: Bayamon soils are in stable coastal plains and in valleys interspersed among the limestone hills (haystacks or pipino hills). They formed in fine-textured sediments of mixed origin. The stability of the landforms enhances the weathering processes, the leaching of bases and weatherable minerals and the accumulation of more stable minerals and sesquioxides. The climate is humid tropical. Slopes range from 2 to 12 percent. The average annual precipitation is 65 inches, and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Almirante, Matanzas, Tanama, and Vega Alta soils. Almirante and Vega Alta soils are on similar positions, have more than 5 percent, by volume, plinthite, and do not have Oxic horizons. Matanzas soils are on similar positions but are deep to limestone bedrock. Tanama soils are on higher positions of toeslopes and side slopes of the limestone hills. In addition, they are shallow to limestone bedrock and do not have an Oxic horizon.

DRAINAGE AND PERMEABILITY: Well-drained; very slow permeability.

USE AND VEGETATION: Most areas of Bayamon soils are used for cropland. Many areas are used for pasture and hayland. This soil is specially suited for pineapples.

DISTRIBUTION AND EXTENT: Humid coastal plains of northern Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico; 1936.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - zone from 0 to 11 inches (Ap and A/B horizons).

Oxic horizon - zone from 11 to 66 inches. (Bo horizons).

ADDITIONAL DATA: Characterization pedon: Manati Municipio, Puerto Rico. Sample number S73PR-091-001. NSSL Lab sample pedon number - 40A1257. Sample by NSSL, Lincoln, NE.

MLRA: 272.

National Cooperative Soil Survey
U.S.A.

LOCATION CAGUABO PR

Established Series
Rev. GRB
06/2002

CAGUABO SERIES

The Caguabo series consists of shallow, well drained soils on side slopes of strongly dissected uplands. They formed in material that weathered from igenous rocks. Near the type location, the mean annual precipitation is about 80 inches and the mean annual temperature is 76 degrees F. Slopes range from 5 to 70 percent.

TAXONOMIC CLASS: Loamy, mixed, active, isohyperthermic, shallow Typic Eutrudepts

TYPICAL PEDON: Caguabo clay loam - native pasture and weeds. (Colors are for moist conditions.)

Ap--0 to 4 inches; dark grayish brown (10YR 4/2) clay loam; weak fine granular structure; friable, slightly sticky, slightly plastic; about 10 percent, by volume, igneous rock fragments; common fine roots; slightly acid; clear smooth boundary. (2 to 5 inches thick)

Bw--4 to 10 inches; brown (10YR 4/3) very gravelly clay loam; weak fine subangular blocky structure parting to weak fine granular; friable, slightly sticky, slightly plastic; about 60 percent, by volume, igneous rock fragments; few fine roots; slightly acid; clear smooth boundary. (4 to 8 inches thick)

C--10 to 16 inches; mixture of weathered and partially weathered igneous rock fragments and saprolite that can be penetrated with the spade. (0 to 7 inches thick)

R--16+ inches; consolidated igneous rock.

TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately 1.5 miles northwest of the town of Anasco; about 300

feet north of intersection of Highways 2 and 110.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 6 to 20 inches and depth to bedrock ranges from 10 to 20 inches. The soil is slightly acid throughout.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 6. Texture is loam, clay loam, or their gravelly analogs.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 2 to 6, and chroma of 3 to 6. Texture is gravelly to extremely analogs of silty clay loam, clay loam, or clay. Content of saprolite ranges from 0 to 20 percent, by volume.

The C horizon, where present, has hue of 7.5YR to 2.5Y, value of 2 to 6, and chroma of 3 to 6; or it has no dominant matrix color and is multicolored. Texture is gravelly or very gravelly analogs of sandy clay loam or clay loam. Content of saprolite ranges from 20 to 60 percent, by volume.

The Cr horizon, where present, is saprolite that is similar in color and texture as the C horizon.

The R layer is consolidated igneous rock.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Caguabo soils are on lower positions of strongly dissected volcanic uplands at elevations below 1,800 feet or 550 meters. Slope range from 5 to 70 percent. They formed in fine-textured residuum or partially weathered igneous rocks. The climate is humid tropical. The average annual precipitation ranges from 75 to 85 inches and the average annual temperature ranges from 75 to 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Juncos, Mabi, Maraquez, Maresua, Morado, Mucara, and Quebrada soils. All of these soils are deeper to bedrock. In addition, the Juncos, Mabi, and Mucara soils are have clayey, smectitic control sections. The Maraguez and Morado soils and have fine-loamy, mixed control sections. Maresua soils have mixed, clayey-skeletal control sections. Quebrada soils have mixed, clayey control sections.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of this soil are used for pasture. A few small areas are planted to woodland. Vegetation consists of native and introduced grasses, shrubs, and trees.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Survey Area, Puerto Rico; 1969.

REMARKS: These soils were formerly included in the Mucara series.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - the zone from 0 to 4 inches (Ap horizon).

Cambic horizon - the zone from 4 to 10 inches (Bw horizon).

Lithic contact - hard bedrock at 16 inches (R layer).

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION CANDELERO PR

Established Series
Rev. BCD
07/2001

CANDELERO SERIES

The Candelero series consists of very deep, somewhat poorly drained, slowly permeable soils on terraces, alluvial fans, and footslopes. They formed in sediments derived from granitic rocks. Slopes range from 0 to 12 percent. The mean annual precipitation is about 87 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, active, isohyperthermic Typic Albaqualfs

TYPICAL PEDON: Candelero loam - sugarcane. (Colors are for the moist soil)

Ap--0 to 7 inches, dark grayish brown (10YR 4/2) loam; weak fine granular structure; very friable; few fine roots; few fine black mineral grains; few concretions 2 to 3 mm in diameter; extremely acid; clear smooth boundary. (5 to 10 inches thick)

Bt1--7 to 11 inches, gray (10YR 6/1) and yellowish brown (10YR 5/8) sandy clay loam, purplish mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; few roots; thin discontinuous gray (10YR 6/1) films on surfaces of peds; black coatings in root channels; common fine quartz grains; extremely acid; clear smooth boundary. (3 to 6 inches thick)

Bt2--11 to 15 inches, gray (10YR 6/1) and yellowish brown 5/6) sandy clay loam; weak medium subangular blocky structure; very firm, slightly sticky, plastic; few roots; thin discontinuous gray (10YR 6/1) films on surfaces of peds; dark films in root channels; common fine quartz grains; few fine black mineral grains; many weathered feldspar and hornblende crystals; very strongly acid; gradual smooth boundary. (3 to 10 inches thick)

Btg1--15 to 24 inches, greenish gray (5GY 6/1) sandy clay loam, common medium distinct brownish yellow (10YR 6/6) mottles; few fine distinct reddish brown mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; few roots; thin discontinuous greenish gray (5GY 6/1) films on surfaces of peds; dark films in root channels; many fine quartz grains; many weathered feldspar and hornblende crystals; strongly acid; gradual smooth boundary. (6 to 15 inches thick)

Btg2--24 to 35 inches, light greenish gray (5GY 7/1) sandy clay loam; common fine distinct greenish gray mottles, common medium distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure; very firm, slightly sticky, slightly plastic; thin discontinuous light greenish gray (5GY 7/1) films on surfaces of peds, gray tends to run in vertical tongues; many fine quartz grains; few fine black mineral grains; many weathered feldspar and horneblend crystals; slightly acid; clear smooth boundary. (0 to 10 inches thick)

BC--35 to 64 inches, dark yellowish brown (10YR 4/4) sandy clay loam, common medium distinct yellowish brown (10YR 5/6) mottles; common fine distinct greenish gray mottles; massive; friable, slightly sticky; many fine quartz grains; many weathered feldspar crystals; common fine black mineral grains; slightly acid.

TYPE LOCATION: Yabucoa, Puerto Rico; 260 feet southwest from km. marker 1.9, Highway 905, and 30 feet northwest of unpaved farm road.

RANGE IN CHARACTERISTICS: Depth to the bottom of the Bt horizon ranges from 25 to 42 inches. The soil is extremely acid or very strongly acid in the A horizon, very strongly acid or strongly acid in the upper part of the Bt horizon, and medium acid or slightly acid in the BC horizon. Few to many quartz grains are mixed throughout the soil. The mean annual soil temperature ranges from 72 to 80 degrees F.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 to 3. It is loam, sandy loam, or sandy clay loam.

The upper part of the Bt horizon has hues of 10YR to 5Y values of 4 to 6, and chroma of 1 to 8. The lower part of the Bt horizon has hues of 10YR to 5GY, values of 3 to 7, and chroma of 0 to 2. They are sandy clay loam, sandy clay, or clay loam. The Bt horizons have weak, medium or coarse subangular blocky or prismatic structures.

The BC horizon has hues of 10YR to 5Y, values of 4 to 6 and chroma of 1 to 8. It is sandy clay loam to clay and silty

clay.

COMPETING SERIES: There are no other known series in the same family.

The Cayagua and Vega Baja series are similar soils in a related family. Both of these soils have a fine particle-size control section.

GEOGRAPHIC SETTING: The Candelero soils are nearly level to sloping soils on terraces, alluvial fans and footslopes. Slopes range from 0 to 12 percent. The soils formed in moderately fine textured sediments high in quartz, feldspar and hornblende minerals derived from granitic rocks. The climate is humid tropical. Average annual rainfall is 87 inches, and average annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Humacao, Mayo and Parcelas soils. The Humacao and Parcelas soils lack dominant low chroma colors and lack an argillic horizon. The Mayo soils have less than 18 percent clay, lack low chroma colors, have thick dark A horizons, lack argillic horizons and occur on footslopes and fans at higher elevations.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained. Runoff is medium and permeability is slow.

USE AND VEGETATION: Most of the acreage is cultivated and used for growing sugarcane. The small uncultivated areas are in Pangola or Guinea grass and are used for pasture.

DISTRIBUTION AND EXTENT: Humid plutonic areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, 1942.

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Aeric Tropaqualfs to Fine-loamy, mixed, isohyperthermic Typic Albaqualfs. The previous OSED date was 3/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 7 inches (Ap horizon)

Argillic horizon - zone from 7 to 35 inches (Bt and Btg horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION CATALINA PR

Established Series
Rev. BCD
07/2001

CATALINA SERIES

The Catalina series consists of very deep, well drained, moderately rapidly permeable soils formed in residuum from volcanic rocks on uplands. Slopes range from 5 to 40 percent. The mean annual precipitation is about 90 inches and the mean annual temperature is about 75 degrees F.

TAXONOMIC CLASS: Very-fine, ferruginous, isohyperthermic Typic Hapludox

TYPICAL PEDON: Catalina clay - native pasture (Colors are for the moist soil)

Ap--0 to 6 inches, dark reddish brown (5YR 3/3) clay with few fine distinct reddish brown (2.5YR 4/4) pockets; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; many sand-size aggregates; few fine pieces of charcoal; medium acid; abrupt smooth boundary (2 to 8 inches thick)

Bo1--6 to 13 inches, dark reddish brown (2.5YR 3/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; common very fine pores; many soft black sand-size aggregates; very strongly acid; clear smooth boundary (6 to 10 inches thick).

Bo2--13 to 20 inches, dark reddish brown (2.5YR 3/4) clay with some ped surfaces having slightly lower chroma; moderate to weak medium and fine subangular blocky structure; firm, slightly sticky, plastic; common fine roots; common very fine pores; few sand-size aggregates; very strongly acid; clear wavy boundary (6 to 12 inches thick).

Bo3--20 to 34 inches, reddish brown (2.5YR 4/5) clay with a few reddish brown (2.5YR 4/4) ped surfaces; weak fine subangular blocky structure; firm, slightly sticky, plastic; very few fine roots; few fine pores; few fine sand-size aggregates;

few pressure surfaces and possibly few thin patchy clay films; very strongly acid; clear smooth boundary (12 to 16 inches thick).

Bo4--34 to 46 inches, dark reddish brown (2.5YR 4/4) clay; weak fine angular blocky structure; firm, slightly sticky, plastic; few fine roots; very few sand-size aggregates; few fine pores; common pressure surfaces and possibly thin patchy clay films; strongly acid; gradual wavy boundary (10 to 16 inches thick).

Bo5--46 to 60 inches, dark reddish brown (2.5YR 3/4) clay; weak fine angular blocky structure; firm, nonsticky, plastic; very few roots; very few sand-size aggregates; very fine pores; common pressure surfaces and possibly some thin patchy clay films; strongly acid; clear smooth boundary (12 to 18 inches thick).

C1--60 to 72 inches, dark reddish brown (2.5YR 3/4) clay; weak fine angular blocky structure; firm, nonsticky, plastic; many fine pores; common pressure surfaces; very few sand-size quartz grains; about 5 percent by volume is saprolite; very strongly acid; gradual smooth boundary (10 to 16 inches thick).

C2--72 to 84 inches, dark reddish brown (2.5YR 3/4) and dark red (2.5YR 3/6) clay; massive; firm, nonsticky, plastic; about 30 percent by volume is saprolite; very strongly acid; gradual smooth boundary.

C3--84 to 120 plus inches, variegated colors of the saprolite; dusky red (10R 3/4), dark reddish brown (2.5YR 3/4) and strong brown (7.5YR 5/8) clay with occasional dark gray and white splotches; massive; firm, nonsticky, plastic, very strongly acid.

TYPE LOCATION: Torrecillas SCD, Puerto Rico; Barranquitas Soil Study Area, 45 feet east of field road and 470 feet south of house at kilometer marker 8.8 of Highway No. 152.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 50 to 80 inches. Mean annual soil temperature at 20 inches is 72 degrees F. or more with less than 9 degrees F. difference between mean summer and mean winter soil temperatures. The organic matter content is less than 20 kilograms in a volume 1 meter square to a depth of 1 meter. No subhorizon below 7 inches is dry for as long as 60 consecutives days during the year. Cation retention ranges from 1 to 10 meq/100 grams of clay. CEC is 16 meq/100 grams of clay or less (ammonium acetate). Base saturation (ammonium acetate) is less than 35 percent in any subhorizon of the oxic. Reaction of the profile varies from

medium acid to very strongly acid. Mineralogy is mixed. Clay is the only type recognized.

The A horizon has colors in hues of 5YR and 2.5R, values of 3 and 4 and chroma of 3 and 4. Structure varies from moderate granular to weak subangular or angular blocky.

The Bo horizons have colors in hues of 2.5YR and 10R, values of 3 and 4, chroma of 4 to 8. The texture is normally clay and the structure ranges from moderate to weak angular or subangular blocky. Pressure induced reflective ped surfaces or thin patchy clay films may be present.

COMPETING SERIES: These are the Rosario, and Coto series in the same Subgroup and the Nipe, Matanzas, Bayamon, Cotito, and Delicias series in the same Suborder. The Rosario soils are shallow over serpentinite rock. The Coto soils are yellower in hues of 7.5YR and 10YR and have kaolinitic mineralogy. The Nipe soils have cation retention in the oxic horizon of less than 1 meq/100 of clay. The Matanzas, Bayamon, and Cotito soils have 35 percent or more base saturation in all subhorizons of the oxic to a depth of 50 inches. The Delicias soils have oxic horizons that extend to depths of 50 inches or more and no pressure faces or clay films in the Bo horizons.

GEOGRAPHIC SETTING: The Catalina soils occur on gently sloping to moderately step sideslopes and hilltops with slope gradients from 5 to 40 percent. The regolith consists of fine textured residuum derived from very highly weathered volcanic rocks. The climate is humid tropical. The mean annual precipitation is from 80 to 100 inches. The mean annual temperature is from 73 to 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Comerio series in addition to the Humatas, Daguey, Cialitos, Consumo and Mucara series, all of which occur in sideslopes of the humid volcanic hills and mountains. The Humatas, Daguey, Cialitos and Consumo soils usually occur on steeper sideslopes which are less stable and more subject to geologic erosion. They are less weathered and have higher CEC (more than 16 meg/100 grams of clay in their Bt horizons). The Mucara soils are shallow over less weathered, harder volcanic rocks.

DRAINAGE AND PERMEABILITY: Well drained, medium runoff, moderately rapid permeability.

USE AND VEGETATION: Cultivated to subsistence crops; plantains, bananas, yams, tanniers, and sugarcane. Some areas are planted to adapted grasses and used as pasture.

DISTRIBUTION AND EXTENT: Humid central mountainous areas of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1936.

REMARKS: The classifiction was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Tropeptic Haplorthox to Very-fine, mixed, isohyperthermic Rhodic Hapludox. The previous OSED was dated 11/67.

The 11/67 revision greatly narrowed the range of Catalina series. The Comerio, Daguey, Humatas, and Consumo series were included in the Catalina series as mapped in the soil survey published in 1936.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 6 inches (Ap horizon)

Oxic horizon - zone from 6 to 60 inches (Bo horizons)

Rhodic feature - 2.5YR hue and 3 value in Bo horizons

National Cooperative Soil Survey
U.S.A.

LOCATION CATANO PR

Established Series
Rev. REG
04/2000

CATANO SERIES

The Catano series is excessively drained, rapidly permeable upland soils. These soils are deep, calcareous, brown sands having more than 4 percent silt plus clay in the control section.

TAXONOMIC CLASS: Carbonatic, isohyperthermic Typic Udipsamments

TYPICAL PEDON: Catano sand--coconut grove.
(Colors are for moist soil.)

A1--0 to 4 inches; light gray (10YR 7/2) sand sized shell fragments, and very dark brown (10YR 2/2) subrounded grains of quartz and miscellaneous volcanic rock fragments with organic matter coatings; overall color is very dark grayish brown (10YR 3/2); single grain; loose, nonsticky, and nonplastic; many fine roots; strong effervescence; clear smooth boundary. (3 to 6 inches thick)

AC--4 to 10 inches; dark brown (overall color) (10YR 3/3) sand and more than 4 percent silt plus clay consisting of light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous volcanics; single grain; loose, nonsticky, and nonplastic; common fine roots; strong effervescence; clear smooth boundary. (4 to 8 inches thick)

C1--10 to 50 inches; brown (overall color) (10YR 4/3) sand and more than 4 percent silt plus clay consisting of light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous subrounded volcanic; singly grain; loose, nonsticky and nonplastic; few fine roots; strong effervescence; clear smooth boundary. (30 to 60 inches thick)

C2--50 to 60 inches; grayish brown (10YR 5/2) (overall color) sand; single grain; loose, nonsticky and nonplastic; very

few fine roots; strong effervescence.

TYPE LOCATION: Oeste SCD, Puerto Rico; 2 miles north of the city of Mayaguez; 1/2 mile on dirt road North of Boquilla bridge, 300 feet East of dirt road.

RANGE IN CHARACTERISTICS: The sandy materials extend to depth of more than 5 feet. Texture of the whole profile is sand. The sand consists of shell fragments, quartz grains, and volcanic subrounded fragments. Percent of silt plus clay in the control section varies from 4 to 10. These soils are single grain, nonsticky, and nonplastic throughout. Effervescence with dilute HCL varies from slight to violent.

Overall colors of the A and AC horizons have hues of 10YR and values and chromas of 2 to 3.

The C horizons have hues of 10YR, values of 4 and 5, and chromas of 2 and 3.
COMPETING SERIES: These are the St. Lucie (P.R.), Aguadilla, Espinal, Arenales, Meros, and Jaucas series. The St. Lucie (P.R.) soils have sands with more than 95 percent quartz. The Aguadilla soils are acid. The Espinal soils have noncalcareous A horizons and lighter colored C horizons. The Arenales, Meros, and Jaucas soils are dry for more than 90 cumulative days in most years. The Arenales and Meros soils are noncalcareous. The Jaucas soils have lighter colored profile.

GEOGRAPHIC SETTING: The Catano soils occur along the coast at elevations close to sea level with slope gradients from 0 to 5 percent. The regolith consists of sand size shell fragments, quartz grains, and miscellaneous volcanic subrounded fragments. The climate is humid tropical. The average annual precipitation is 76 inches and the mean annual temperature is 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F. with less than 9 degrees F. difference between mean summer and winter temperatures.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Aguadilla, St. Lucie (P.R.), and Espinal series in addition to the Corcega, and Coloso series and the land type coastal Beach. The Corcega and Coloso soils are finer textured, have low chroma mottles, and occur farther inland. The land type coastal Beach consists of unstabilized wave reworked narrow strips of sand along the coast.

DRAINAGE AND PERMEABILITY: Excessively drained; runoff is very slow, and permeability is rapid.

USE AND VEGETATION: Mostly on coconuts and undergrowth of pasture. Small acreage is in subsistence crops.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1942; Soil Survey of Puerto Rico.

National Cooperative Soil Survey
U. S. A.

LOCATION CAYAGUA PR

Established Series
Rev. RLV
07/2001

CAYAGUA SERIES

The Cayagua series have dark grayish brown, moderately coarse textured, granular A horizons, light brownish gray, mottled, fine textured B horizons over moderately coarse textured, mottled yellowish red and gray C horizons.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Aeric Albaqualfs

TYPICAL PEDON: Cayagua sandy loam - pasture (Colors are for the moist soil)

Ap--0 to 4 inches, dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable, nonsticky, nonplastic; many fine roots; few medium iron concretions between Ap and Bt1; strongly acid; abrupt smooth boundary (2 to 6 inches thick).

Bt1--4 to 10 inches, light brownish gray (10YR 6/2) clay with many coarse distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very firm slightly sticky, plastic; common fine roots; patchy clay films on ped surfaces and root channels; very strongly acid; clear wavy boundary (4 to 8 inches thick).

Bt2--10 to 20 inches, light brownish gray (10YR 6/2) clay with many coarse distinct strong brown (7.5YR 5/6) and few fine distinct red (2.5YR 5/6) mottles; weak coarse angular blocky structure; firm, slightly sticky, plastic; few fine roots; thin patchy clay films on ped surfaces and root channels; very strongly acid; clear wavy boundary (8 to 12 inches thick)

BC--20 to 27 inches, sixty percent yellowish red (5YR 5/6) sandy loam; massive; friable, nonsticky, nonplastic; 40 percent light gray (10YR 7/1) clay; massive; friable, nonsticky plastic; few fine roots; very strongly acid; gradual wavy boundary (4 to 10 inches thick)

C1--27 to 36 inches, sixty percent by volume yellowish red (5YR 4/6) sandy loam; massive; friable, nonsticky, nonplastic; 40 percent light gray (10YR 7/1) clay; massive friable, nonsticky, plastic; quartz seams in the clayey sections; very strongly acid; gradual wavy boundary (6 to 12 inches thick)

C2--36 to 100 inches, yellowish red (5YR 4/6) and reddish yellow (7.5YR 6/6) sandy loam; massive; very friable, nonsticky, nonplastic; slightly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 3.0 miles northwest of the town of Humacao, 450 feet west of kilometer marker 0.7, Highway No. 953 (75 feet west of fence).

RANGE IN CHARACTERISTICS: Thickness of the solum varies from 18 to 36 inches. Mean annual soil temperature at 20 inches is 72 degrees F. or more with less than 9 degrees F. difference between mean summer and mean winter soil temperatures. Mineralogy is mixed. Base saturation (by sum of cations) is 35 percent or more at 50 inches below the top of the argillic horizon. The surface textures vary from clay loam to sandy loam.

The A horizon has colors in hues of 10YR and 2.5Y, values of 3 and 4, chroma of 2 to 4.

The matrix colors of the Bt horizons are in hues of 10YR and 2.5Y, values of 4 to 7, chroma of 2 or less. Mottles range from common to many, fine to coarse, strong brown, yellowish brown and red. Reaction varies from strongly to very strongly acid. Clay film range from thin patchy to thin continuous. The Bt horizon ranges in thickness from 12 to 20 inches and in texture from clay to sandy clay.

The BC and C1 horizons have matrix colors in hues of 7.5YR or 5YR, values of 4 to 6 and chroma of 4 to 8. The mottles are light to grayish brown. Reaction ranges from strongly to very strongly acid. The C2 horizon ranges in texture from sandy loam to sandy clay loam and in reaction from moderately acid to neutral.

COMPETING SERIES: There are no series in the same family. Soils in similar families include the Fajardo, Vega Baja, and Candelero series. The Fajardo and Vega Baja soils have finer textured A and C horizons. The Fajardo soils have redder mottles and stronger structure in the argillic horizon. The Vega Baja soils have clayey horizons below the argillic horizon and endosaturation. The Candelero soils have coarser textured argillic horizons.

GEOGRAPHIC SETTING: The Cayagua soils occur on gently to strongly sloping footslopes and sideslopes with slope gradients from 2 to 20 percent. The regolith consists of residuum derived from coarse textured plutonic rocks. The climate is humid tropical. The mean annual precipitation is from 80 to 90 inches. The mean annual temperature is from 76 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the similar Candelero series, these are the Mayo, Pandura, Ingenio, and Limones series. The Candelero soils occupy alluvial fans in positions below the Cayagua soils and are also poorly drained. The Mayo soils occupy footslopes and alluvial fan positions below Cayagua soils and are well to excessively drained. The Pandura soils occur on steep sideslopes in positions overlying the Cayagua soils and are shallow over the plutonic rocks. The Ingenio and Limones soils are red, well drained and occupy positions in sideslopes and hilltops above the Cayagua soils.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained, slow runoff, slow permeability.

USE AND VEGETATION: The major use is for the production of sugarcane. Many areas have been planted to Pangola and other adapted grasses and used as pasture. The native vegetation is mostly native grasses and shrubs.

DISTRIBUTION AND EXTENT: Humid plutonic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1936.

REMARKS: The Cayagua series was formerly classified in the Gray Brown Podzolic soil group of the 1938 Soil Classification. This update changes the classification from Ochraqualfs to Epiaqualfs.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon)

Argillic horizon - zone from 4 to 20 inches (Bt horizon)

MLRA = 270

SIR = PR0032

National Cooperative Soil Survey
U.S.A.

LOCATION COLINAS PR

Established Series
Rev. LHR:REG
06/2002

COLINAS SERIES

The Colinas series is well drained, moderately permeable upland soils. These soils have dark brown, granular A horizons and lighter colored, friable, weakly developed B horizons over soft limestone.

TAXONOMIC CLASS: Coarse-loamy, carbonatic, isohyperthermic Typic Haprendolls

TYPICAL PEDON: Colinas clay loam--sugarcane.
(Colors are for moist soil.)

Ap--0 to 6 inches; dark brown (10YR 3/3) moist and grayish brown (10YR 5/2) dry, clay loam; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; 3 percent by volume limestone fragments; violent effervescence; clear smooth boundary. (4 to 8 inches thick)

B2--6 to 12 inches; dark grayish brown (10YR 4/2) clay loam with few fine light yellowish brown (2.5Y 6/4) wormcasts; weak medium subangular blocky breaking to weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; 8 percent by volume common fine and medium limestone fragments 1/2 inch to 1 inch in diameter; violent effervescence; gradual smooth boundary. ((4 to 8 inches thick)

B3--12 to 16 inches; pale brown (10YR 6/3) clay loam; weak medium subangular blocky structure with stringers of B2 along fracture planes; friable, nonsticky and slightly plastic; few fine roots; 8 percent by volume common fine and medium limestone fragments 1/4 inch to 1 inch in diameter; strong effervescence; gradual smooth boundary. (4 to 8 inches thick)

C1--16 to 20 inches; light yellowish brown (10YR 6/4) clay loam with dark coatings along root channels; massive;

friable, nonsticky, slightly plastic; common fine and medium limestone fragments 1/4 inch to 1 inch in diameter; few fine roots; violent effervescence; gradual wavy boundary. (4 to 6 inches thick)

C2--20 to 60 inches; mixture of soft yellow and white limestone containing 8 percent by volume common fine and medium fragments and concretions 1/4 inch to 1 inch in diameter.

TYPE LOCATION: Culebrinas SCD, Puerto Rico; 3.5 miles east of the town of Moca; 900 meters on dirt road north of kilometer marker 9.65 of Highway 111. 50 feet west of dirt road.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 12 to 24 inches. Depth to the soft limestone is 16 to 32 inches. Limestone fragments below the A horizon ranges from 5 percent to 10 percent by volume and from 1/4 to 1 inch in diameter. It is calcareous throughout. The mean annual soil temperature ranges from 74 degrees F. to 76 degrees F.

The A horizon has hues of 10YR, values of 3, and chromas of 2 and 3. It is clay loam. Same pedons have 20 to 50 percent cobbles in the A horizon. It is friable, slightly sticky and slightly plastic.

The B2 horizon has hues of 10YR, values of 4 to 6, and chromas of 2 and higher. It is clay loam or silty clay loam. It is slightly sticky to nonsticky and plastic. The B3 horizon is slightly plastic to plastic.

COMPETING SERIES: There are no other known series in the same family. The Aguilita, Fredensborg, Naranjo, Pozo Blanco, Santa Clara, Sion, Sollar, Tuque and Yauco series are simmilar soils in related families. The Aguilita, Fredensborg, Pozo Blanco, Sion, Yauco and Tuque soils have ustic moisture regimes. The Naranjo and Santa Clara soils are not calcareous in the B horizons. The Sollar soils are finer textured and are underlain by hard limestone.

GEOGRAPHIC SETTING: The Colinas soils are moderately steep to very steep. They are on ridges and sideslopes of low limestone hills. Slopes range in gradient from 12 to 60 percent. They formed in residuum from soft limestone. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature is 76 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Santa Clara, Naranjo, and Sollar series in addition to the Camaguey series and the land type Limestone Outcrop. The Camaguey series have thicker and darker A

horizons, lack cambic horizons, and have slickensides and pressure faces. The land type Limestone Outcrop has 75 percent or more of the surface area covered by limestone rock outcrops.

DRAINAGE AND PERMEABILITY: Well drained, runoff is medium to rapid, and permeability is moderate.

USE AND VEGETATION: Sugarcane and pasture. Small acreage is in brush.

DISTRIBUTION AND EXTENT: Humid limestone uplands in the northern coastal plains of Puerto Rico. The series is of moderate extent with about 35,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1942; Soil Survey of Puerto Rico.

Additional Data: Lincoln Lab. characterization data S-73PR-07-5, 74B-186 to 74B-188.

National Cooperative Soil Survey
U. S. A.

LOCATION COLOSO PR

Established Series
Rev. GRB
10/2001

COLOSO SERIES

The Coloso series consists of very deep, somewhat poorly drained, slowly permeable soils on flood plains and terraces. They formed in stratified loamy and clayey alluvial sediments. Near the type location, the mean annual precipitation is about 80 inches and the mean annual air temperature is about 78 degrees F. Slopes range from 0 to 8 percent.

TAXONOMIC CLASS: Very-fine, kaolinitic, acid, isohyperthermic Aeric Endoaquepts

TYPICAL PEDON: Coloso silty clay loam - sugarcane. (Colors are for moist soil.)

Ap--0 to 7 inches; brown (10YR 4/3) silty clay loam; weak medium granular structure; firm, slightly sticky, plastic; many fine roots; few worm holes; slightly acid; clear smooth boundary. (5 to 12 inches thick)

Bw--7 to 13 inches; brown (10YR 4/3) silty clay loam, weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few worm holes; few fine black (10YR 2/1) concretions; common fine distinct yellowish red (5YR 4/6) masses of iron accumulation and common fine faint light gray (10YR 7/2) areas of iron depletion; slightly acid; clear smooth boundary. (0 to 10 inches thick)

Cg1--13 to 33 inches; about 50 percent dark gray (10YR 4/1) and 50 percent light gray (5Y 7/1) silty clay loam; massive; firm, slightly sticky, plastic; few fine roots; few worm holes; common fine black (10YR 2/1) concretions; many medium distinct reddish brown (5YR 4/3) masses of iron accumulation; the areas in colors of dark gray and light gray are iron depeletions; slightly acid; gradual smooth boundary. (15 to 25 inches thick)

Cg2--33 to 60 inches; dark gray (10YR 4/1) silty clay; massive; firm, slightly sticky, plastic; few fine roots; few worm

holes; common fine black (10YR 2/1) concretions; many fine faint yellowish brown (10YR 5/8) masses of iron accumulation and common fine distinct greenish gray (5GY 5/1) areas of iron depletion; slightly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately one kilometer west of the town of Anasco; about 250 meters west of kilometer marker 145.5 of Highway 2, and fifty feet north of farm road.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 7 to 22 inches. Rock fragments range from 0 to 10 percent by volume throughout the profile. Reaction ranges from moderately acid to slightly acid throughout the profile.

The A or Ap horizon have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silty clay loam or silty clay.

The Bw horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Redoximorphic features in shades of red, yellow, brown, or gray range from few to many. Texture is silty clay loam, silty clay, or clay.

The C horizons have hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 to 4. Redoximorphic features in shades of red, yellow, or brown range from few to many. Texture is silty clay loam, silty clay, or clay.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Coloso soils are on river flood plains and terraces. They formed in stratified loamy and clayey alluvial sediments of mixed origin. Slopes range from 0 to 8 percent. The climate is humid tropical. The average annual precipitation ranges from 78 to 82 inches and the mean annual air temperature is 77 to 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Bajura, Corcega, Dique, and Toa series. The poorly drained Bajura soils have mixed mineralogy and Vertic subgroups. Corcega soils are fine-loamy over sandy or sandy-skeletal. The well drained Dique soils are fine-loamy. The well drained Toa soils have mixed mineralogy and a Mollic epipedon.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow permeability.

USE AND VEGETATION: Most areas of Coloso soils are used for sugarcane production. Some areas are used for

pasture. A few areas are in woodland consisting of native and introduced species.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon.

Ochric epipedon - the zone from 0 to 7 inches (Ap horizon).

Cambic horizon - the zone from 7 to 13 inches (Bw horizon).

Aquic feature - apparant water table; 2 to 4 feet; July through September.

ADDITIONAL DATA: Rio Grande Municipality, Puerto Rico; S93PR-119-009 and S93PR-119-012. Samples by NSSL, Lincoln, NE.

MLRA: 270, 272.

National Cooperative Soil Survey
U.S.A.

LOCATION CONSUMO PR

Established Series
Rev. BCD
02/98

CONSUMO SERIES

The Consumo series consists of moderately deep to saprolite, well drained, moderately permeable soils formed in residuum from basic volcanic rocks. They are steep to very steep soils on side slopes and ridges of maturely dissected uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is about 76 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Consumo clay--Pangolagrass. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 6 inches; reddish brown (5YR 4/4) clay; moderate medium granular structure; slightly hard friable, slightly sticky and slightly plastic; many fine roots; very strongly acid, clear smooth boundary. (4 to 8 inches thick)

Bt1--6 to 14 inches; red (2.5YR 4/8) clay; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; common fine roots; common fine pores and root channels; thin patchy clay films; very strongly acid; gradual smooth boundary. (6 to 8 inches thick)

Bt2--14 to 20 inches; red (2.5YR 4/8) rubbed color clay; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; thin patchy clay films; 50 percent of the horizon consists of saprolite; very strongly acid; gradual smooth boundary. (4 to 8 inches)

C--20 to 60 inches; variegated colors of the saprolite, which include red (2.5YR 4/8, 5/8), yellow (10YR 7/8), brown (7.5YR 5/4), light gray (10YR 7/1), silty clay loam; massive; black coatings on some faces; very friable, nonsticky, slightly

plastic; very strongly acid. Original rock structure is visible and weathered rock fragments can be easily broken between fingers.

TYPE LOCATION: Oeste SCD, Puerto Rico; 8 miles east of the city of Mayaguez; 100 feet west and 50 feet south of kilometer marker 13.5 on Highway 106.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 14 to 24 inches. Thickness of the agrillic horizon varies from 10 to 16 inches. This soil is strongly to very strongly acid throughout. The mean annual soil temperature ranges from 74 to 76 degrees F.

The A horizon has hues of 5YR or 2.5YR, values of 4 or 5, and chromas of 4 to 6. It is slightly sticky and slightly plastic or plastic.

The Bt horizon has hues of 5YR or 2.5YR, values of 4 or 5, and chroma of 6 or 8. It is clay in the upper part and clay or silty clay in the lower part. Structure varies in grade from weak to moderate subangular blocky. It is slightly sticky to nonsticky, and slightly plastic. Clay films vary from thin patchy to thin discontinuous. Saprolite ranges from 10 to 60 percent in the lower part.

The BC horizon, where present is clay or silty clay. Saprolite ranges from 40 to 80 percent. Consistence is nonsticky to slightly sticky.

COMPETING SERIES: There are no other known series in the same family. The Caspar, Consejo, Corozal, Corozo, Ingenio, Jagueyes, Lirios, Maricao, Moca, Patillas, and Rio Piedras series are similar soils in related families. The Caspar, Consejo, Lirios and Rio Piedras soils have argillic horizons thicker than 16 inches. The Corozal soils have thicker argillic horizons and low chroma mottles. The Corozo, Ingenio, and Jagueyes soils have thicker argillic horizons and CEC values lower than 24 meq/100 grams of clay. The Maricao soils have colder soil temperatures, lower than 72 degrees F. (mean annual). The Moca soils have thicker argillic horizons and also have higher COLE values and cracks when dry. The Patillas soils have coarser textured profiles with less than 35 percent clay.

GEOGRAPHIC SETTING: The Consumo soils are steep to very steep soils on side slopes and ridges. Slope gradients range from 20 to 60 percent. The soils formed in fine over coarser textured residuum weathered from basic volcanic rock.

The climate is humid tropical. The average annual precipitation is 73 to 80 inches, and the mean annual temperature is 75 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Anones, Daguey, Humatas, Morado, and Mucara series. The Anones soils have weaker structure in the B horizons, lack clay skins, and are pinkish colored. Daguey and Humatas soils are deeper and have argillic horizons thicker than 16 inches. Morado and Mucara soils have coarser textured profiles, are less acid, and shallower to the basic volcanic rock.

DRAINAGE AND PERMEABILITY: Well drained; rapid runoff; moderate permeability.

USE AND VEGETATION: Used for coffee, pasture and food crops.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Dystropeptic Haplohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED date was 10/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 6 inches (Ap horizon)

Argillic horizon - zone from 6 to 20 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION COROZAL PR

Established Series
Rev. BCD
07/2001

COROZAL SERIES

The Corozal series consists of very deep, somewhat poorly drained, slowly permeable soils formed in residuum on volcanic hills. Slopes range from 2 to 12 percent. The mean annual precipitation is about 77 inches and the mean annual temperature is about 76 degrees F.

TAXONOMIC CLASS: Very-fine, parasesquic, isohyperthermic Typic Hapludults

TYPICAL PEDON: Corozal clay - Pangola grass. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; dark reddish brown (5YR 3/4) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic, many fine roots; very strongly acid, clear wavy boundary. (6 to 10 inches thick)

Bt1--7 to 9 inches; mixed dark red (2.5YR 3/6) and grayish brown (10YR 5/2) clay; moderate fine subangular blocky structure; firm, slightly sticky, plastic; thick continuous clay films, many fine roots; very strongly acid; clear wavy boundary. (1 to 3 inches thick)

Bt2--9 to 13 inches; red (2.5YR 4/6) clay with reddish brown (5YR 4/4) on surfaces of peds and root channels; moderate medium prismatic breaking to moderate medium subangular blocky structure; firm, slightly sticky, plastic; thick continuous clay films, many fine roots; very strongly acid; gradual wavy boundary. (4 to 10 inches thick)

Bt3--13 to 24 inches; red (2.5YR 4/6) clay with yellowish brown (10YR 5/6) coatings on surfaces of peds and root channels; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin continuous clay films on faces of peds and root channels; common fine roots; very strongly acid; gradual wavy boundary. (8 to 15 inches thick)

Bt4--24 to 32 inches; red (2.5YR 5/6) clay with yellowish brown (10YR 5/6) on surfaces of peds and root channels; moderate medium subangular blocky breaking to weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; very few patchy clay films on vertical faces of peds; few fine roots; very strongly acid; gradual wavy boundary. (7 to 14 inches thick)

Bt5--32 to 40 inches; yellowish red (5YR 5/6) clay; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; very few patchy clay films on vertical faces of peds; about 30 percent by volume of soil mass is saprolite; pseudomorphs of feldspars easily crushed to shiny faces (kaolin books); very strongly acid; gradual irregular boundary. (6 to 18 inches thick)

C--40 to 60 inches; variegated colors of the saprolite; yellowish red (5YR 5/6), light gray (5YR 7/1), and strong brown (7.5YR 5/6) clay loam; massive; friable, slightly sticky, slightly plastic; saprolite easily worked with fingers, rock structure visible, pseudomorphs of feldspars easily crushed to shiny faces (kaolin books); very strongly acid.

TYPE LOCATION: Cibuco SCD, 3 miles southwest of Corozal, Puerto Rico, at Corozal Experiment Substation farm, 60 feet west of cattle weighing pen.

RANGE IN CHARACTERISTICS: The base saturation (by sum of cations) is below 35 percent throughout the solum.

The Ap horizon has color values of 3 or 4, with chromas of 4 in hues of 5YR or 7.5YR.

The Bt horizons have values of 4 or 5, with chromas of 4 to 8 in hues of 2.5YR or 5YR. Structure ranges from strong to moderate, and clay films range from thick continuous to thin patchy. Percent by volume of saprolite in the lower Bt horizon ranges from 20 to 40. Organic matter in the upper 6 inches of the argillic is below the 1.5 percent level.

The BC horizon, where present has value of 4 or 5, chroma of 4 or 6 in hues of 5YR. This horizon lacks clay films and has 30 to 60 percent saprolite.

COMPETING SERIES: These include the Cialitos, Consumo, Daguey, Humatas, Ingenio, Jagueyes, Lares, Rio Piedras, and Vega Alta series all of which are well drained and lack low chroma mottles in the upper part of the argillic

horizon. Cialitos, Daguey, Humatas, and Lares soils have more than 1.5 percent organic matter in the upper part of the argillic horizons. The Consumo soils have Bt horizons less than 10 inches thick. The Ingenio and Jagueyes soils are more weathered and have lower exchange capacities in the argillic horizon. The Vega Alta soils have more than 10 percent plinthite by volume in the upper 60 inches of the soil.

GEOGRAPHIC SETTING: The Corozal soils occur on gently to moderately sloping interfluves of strongly dissected low volcanic hills with slope gradients range from 2 to 12 percent. These low hills occupy a transitional area between limestone and volcanic geologic formations. The soil formed in moderately fine to fine textured residuum of highly weathered volcanic rocks. The climate is humid tropical. The annual rainfall ranges from 75 to 90 inches and the mean annual temperature is from 74 to 78 degrees F. The variation between mean summer and mean winter soils temperatures at 20 inches is less than 9 degrees F.

GEOGRAPHICALLY ASSOCIATED: These include the competing Consumo and Humatas series.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow to medium runoff; slow permeability. A perched water table occurs during the rainy season.

USE AND VEGETATION: Previously used for pineapple, sugarcane and clean tilled subsistence crops. At present time in Pangola grass and used for pasture.

DISTRIBUTION AND EXTENT: The Corozal series was recognized and classified at the Corozal Experiment substation farm. It occurs in a narrow band in the contact between the limestone and the volcanic geologic formations in the northern part of Puerto Rico.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: San Juan Area, Puerto Rico; 1974.

REMARKS: The classification was changed with the 4/91 draft from Clayey, mixed, isohyperthermic Aquic Tropudults to Clayey, mixed, isohyperthermic Aquic Haplohumults. The previous OSED date was 2/86.

The Corozal series was formerly mapped with the Lares series in the Soil Survey of Puerto Rico. The lower subsoil colors are characteristic of a well drained soil, but the upper subsoil has characteristics of a somewhat poorly drained soil. This is due to a perched water table that persists during the rainy season.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 9 inches (Ap and Bt1 horizon)

Argillic horizon - zone from 7 to 40 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION DAGUEY PR

Established Series
Rev. BCD
06/2002

DAGUEY SERIES

The Daguey series consists of very deep, well drained, moderately permeable soils on sideslopes, ridgetops and footslopes in volcanic uplands. They formed in fine textured residuum weathered from volcanic rock. Slopes range from 2 to 40 percent. The mean annual precipitation is about 85 inches and the mean annual temperature is about 76 degrees F.

TAXONOMIC CLASS: Very-fine, kaolinitic, isohyperthermic Inceptic Hapludox

TYPICAL PEDON: Daguey clay--pasture. (Colors are for moist soil.)

Ap--0 to 10 inches; brown (7.5YR 4/4) clay; weak medium subangular blocky parting to moderate fine granular structure; firm, slightly sticky, slightly plastic; very strongly acid; abrupt wavy boundary. (8 to 12 inches thick)

Bo1--10 to 14 inches; reddish brown (5YR 5/4) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; clear smooth boundary. (3 to 5 inches thick)

Bo2--14 to 23 inches; yellowish red (5YR 4/6) clay; few medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular and angular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; clear smooth boundary. (6 to 11 inches thick)

Bo3--23 to 31 inches; red (2.5YR 4/6) clay; strong medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin continuous clay films on ped faces; very strongly acid; gradual smooth boundary. (6 to 10 inches thick)

Bo4--31 to 43 inches; red (2.5YR 4/6) clay; strong medium and fine subangular blocky structure; firm, slightly sticky,

slightly plastic; thin patchy clay films; very strongly acid; gradual smooth boundary. (8 to 14 inches thick)

Bo5--43 to 59 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; very strongly acid; gradual smooth boundary. (10 to 20 inches thick)

Bo6--59 to 72 inches; red (2.5YR 4/6) clay; weak medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; very thin patchy clay films; few small angular fragments of rock; very strongly acid; clear smooth boundary. (10 to 16 inches thick)

C--72 to 86 inches; yellowish red (5YR 4/6) silty clay loam; common fine strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) mottles; massive with evidence of original rock structure; friable, slightly sticky, slightly plastic; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)

Cr--86 to 90 inches; Saprolite with well defined rock structure, similar in color and texture to C1 horizon.

TYPE LOCATION: Cibuco SCD, Puerto Rico; 40 feet west of Highway 113, 80 feet south of road junction to house.

RANGE IN CHARACTERISTICS: The solum is 60 to 80 inches thick. The soil is strongly or very strongly acid. Catlon exchange capacity ranges from 8 to 16 meq/100 grams of clay in the kandic horizon. The organic carbon content in the upper 6 inches of the kandic horizon ranges from 1.0 to 1.6.

The Bo horizon has hue of 10R or 2.5YR, value of 4 to 5 and chroma of 6 through 8. Yellowish brown mottles are few or common and are more evident in the upper B horizons.

COMPETING SERIES: The Aibonito and Alonso series are in the same family. The Aibonito soils have yellower B horizons. The Alonso soils have darker colors with chroma of 3 or less.

GEOGRAPHIC SETTING: The Daguey soils are gently sloping to steep soils on stable hilltops, side slopes, and foot slopes of the volcanic uplands with slope of 2 to 40 percent. The soil is formed in fine textured residuum from very highly weathered basic volcanic rocks. The climate is humid tropical. The average annual precipitation ranges from 70 to 85 inches and the mean annual temperature ranges from 74 to 76 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Consumo and Humatas soils. The Consumo soils occur on steeper less stable surfaces and have thinner B horizons. The Humatas soils have a CEC of more than 24 megs.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: Coffee, pasture and food crops.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of moderate extent, about 16,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.

REMARKS: The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Orthoxic Tropohumults to Very-fine, mixed, isohyperthermic Typic Kandiudox. The previous OSED was dated 4/87.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - zone from 0 to 10 inches (A horizon)

Oxic horizon - zone from 10 to 72 inches (Bo horizons)

ADDITIONAL DATA: Characterization data are available for pedon S61PR-8-3 and S61PR-8-6.

National Cooperative Soil Survey
U.S.A.

LOCATION DESCALABRADO PR

Established Series
Rev. GRB
06/2002

DESCALABRADO SERIES

The Descalabrado series consists of shallow, well drained, moderately permeable soils on uplands. They formed in material weathered from basic volcanic rock. Near the type location, the mean annual temperature is about 79 degrees F., and the mean annual precipitation is about 35 inches. Slopes range from 2 to 60 percent.

TAXONOMIC CLASS: Clayey, mixed, superactive, isohyperthermic, shallow Typic Haplustolls

TYPICAL PEDON: Descalabrado clay loam--pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 5 inches; dark brown (10YR 3/3) clay loam; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable; slightly sticky and slightly plastic; common fine roots; about 10 percent, by volume, angular pebbles of volcanic rock; neutral; clear smooth boundary. (4 to 8 inches thick)

Bw--5 to 12 inches; dark brown (7.5YR 3/2) gravelly clay; weak fine subangular blocky structure; slightly hard, firm; slightly sticky and slightly plastic; few fine roots; about 30 percent, by volume, angular pebbles of volcanic rock; neutral; clear wavy boundary. (6 to 12 inches thick)

R--12 inches; hard basic volcanic rock; few seams of secondary carbonates in cracks in upper part.

TYPE LOCATION: Lajas Valley, Puerto Rico. Approximately 0.3 miles east of km. 13.1, Highway 103 and about 132 feet north of cement marker AFF No. 38 on edge of main irrigation canal.

RANGE IN CHARACTERISTICS: Depth to bedrock ranges from 10 to 20 inches. Rock fragments range from 0 to

30 percent in the A and Bw horizons. Reaction ranges from slightly acid to slightly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam or their gravelly or cobbly analogs.

The Bw horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is clay loam, clay, or their gravelly or cobbly analogs.

Some pedons have a thin Cr layer composed of highly fractured volcanic rock. Colors are similar to the Bw horizon.

The R layer is hard, basic volcanic rock.

COMPETING SERIES: There are no known competing series in the same family.

GEOGRAPHIC SETTING: Descalabrado soils are on hills and mountains. They formed in material that weathered from basic volcanic rock. The climate is tropical semiarid. Slopes are 2 to 60 percent. The average annual temperature ranges from 77 to 81 degrees F., and the average annual precipitation ranges from 30 to 40 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Aguilita, Guayama, Jacana, and Juana Diaz soils. Aguilita soils are generally on lower positions, are deep to limestone bedrock and are carbonatic. Guayama soils are on similar positions, have argillic horizons, and do not have a mollic epipedon. Jacana soils are on slightly lower positions and are moderately deep to volcanic rock. Juana Diaz soils are on similar positions, are shallow to semiconsolidated sandstone, and do not have mollic epipedons.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas are used for pastureland. A few areas are used for crops including corn, tobacco, pigeon peas, avocado, and mangos. Vegetation includes guineagrass, buffelgrass, and other native and introduced species.

DISTRIBUTION AND EXTENT: Semiarid uplands of southern Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: St. Croix, Virgin Islands, 1932.

REMARKS: The original concept of this series was 15 to 35 inches of residuum over volcanic bedrock as mapped by Dr. James Thorp during the first 1932 soil survey of St. Croix. This soil was correlated as a Lithic Vertic Ustropept in the 1970 Soil Survey of the Virgin Islands. The type location was moved to Lajas Valley, Puerto. This series was not correlated in the USVI soil survey update.

Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - zone from 0 to 12 inches (Ap and Bw horizons).

Cambic horizon - zone from 5 to 12 inches (Bw horizons).

Lithic contact - at 12 inches (R layer).

ADDITIONAL DATA: Sampled as S61PR-14-8. Sample by NSSL, Lincoln, NE.

National Cooperative Soil Survey
U.S.A.

LOCATION DIQUE PR

Established Series
Rev. RER
08/2000

DIQUE SERIES

The Dique series have dark grayish brown A horizons over dark yellowish brown B and C horizons and are friable, medium acid, and medium textured throughout.

TAXONOMIC CLASS: Fine-loamy, mixed, active, isohyperthermic Fluventic Eutrudepts

TYPICAL PEDON: Dique silt loam - sugarcane.
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; medium acid; clear smooth boundary. (4 to 8 inches thick)

Bw1--6 to 12 inches; dark grayish brown(10YR 4/2) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; medium acid; clear smooth boundary. (4 to 8 inches)

Bw2--12 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; medium acid; gradual smooth boundary. (12 to 30 inches thick)

C--36 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; friable, slightly sticky, slightly plastic; few fine roots, medium acid.

TYPE LOCATION: Suroeste SCD, Puerto Rico; 3 miles southeast of the town of Hormigueros; 400 feet northeast of Eureka Sugar Mill, 100 feet north of Rosario river; 150 feet west of farm road.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 20 to 40 inches. Thin lenses of sand or coarser materials may occur at different depths in the profile.

The A horizon has hue of 10YR, value of 4 or 5 and chroma of 2 through 4. It is silt loam.

The B horizon has hue of 10YR, value of 4 or 5 and chroma of 2 to 4. It is loam or silt loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 and chroma of 4 to 6. It is loam or silt loam.

COMPETING SERIES: This is the Humacao series in the same family. The Humacao soils are more acid.

GEOGRAPHIC SETTING: The Dique soils occur in nearly level river floodplains in natural levees near the streams or rivers with slope gradients ranging from 0 to 2 percent. The soil formed in medium textured alluvium of mixed origin. The average annual precipitation is 72 inches. The average annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bajura, Coloso, Reilly and Toa series, all of which occur in the river floodplains. The Bajura an Coloso soils have finer textured profiles and are wetter, have low chroma mottles. The Reilly soils are shallower, excessively drained, and coarser textured throughout. Toa soils have mollic epipedons.

DRAINAGE AND PERMEABILITY: Well drained; medium run-off; moderate permeability.

USE AND VEGETATION: Most of the acreage is in sugarcane.

DISTRIBUTION AND EXTENT: Humid river floodplains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Mayagues Survey Area, Puerto Rico; l963.

REMARKS These soils were formerly included in the Toa series

Diagnostic horizons and features recognized in this pedon are:
Ochric epipedon - zone from 0 to 6 inches (Ap horizon)

Cambic horizon - zone from 6 to 36 inches (Bw1, Bw2 horizon)

National Cooperative Soil Survey
U.S.A.

LOCATION DURADOS PR

Established Series
Rev. RER
4/87

DURADOS SERIES

The Durados series consists of deep excessively drained, rapidly permeable soils on river terraces and old beaches in coastal plains. They formed in coarse textured materials derived from sand-sized shell fragments and volcanic fragments. Slopes range from 0 to 2 percent. Mean annual precipitation is 70 inches and the mean annual temperature is 78 degrees F.

TAXONOMIC CLASS: Sandy, mixed, isohyperthermic Fluventic Hapludolls

TYPICAL PEDON: Durados sandy loam - coconuts.
(Colors are for moist soil unless otherwise stated.)

A1--0 to 14 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; very friable, nonsticky, nonplastic; few fine roots; few medium coconut roots; neutral; clear smooth boundary. (10 to 20 inches thick)

A2--14 to 23 inches; dark brown (7.5YR 3/3) loamy fine sand; single grained, loose; few fine cemented sandy concretions; neutral; clear smooth boundary. (8 to 10 inches thick)

C1--23 to 38 inches; very pale brown (10YR 7/4) sand; single grained, loose; common strata of very dark grayish brown (10YR 3/2) sand; 25 percent cemented, calcareous light gray (5Y 7/1) sand pebbles; moderately alkaline, calcareous; abrupt smooth boundary. (10 to 20 inches thick)

C2--38 to 60 inches; dark yellowish brown (10YR 4/4) sand black (10YR 2/1), brownish yellow (10YR 6/6) and light yellowish brown (10YR 6/4) single grained, loose; thin layer of cemented sand that can be penetrated with an auger; common strata of black (10YR 2/1), brownish yellow (10YR 6/6) and light yellowish brown (10YR 6/4) sand; few sea shell fragments; common quartz sand grains; moderately alkaline; calcareous.

TYPE LOCATION: San Juan SCD, Puerto Rico, 0.2 miles north and west from kilometer marker 19.9 on highway 165, following dirt road and 150 feet north of the road.

RANGE IN CHARACTERISTICS: Thickness of the mollic epipedon ranges from 10 to 30 inches. Depth to cemented sandy concretions ranges from 12 to 16 inches, and depth to cemented sandy layers ranges from 30 to 46 inches. The reaction ranges from neutral in the surface layer to strongly alkaline in the lower C horizon.
The A horizon has hue of 10YR or 7.5YR, value and chroma of 2 or 3. Texture ranges from sandy loam in the upper part to loamy fine sand in the lower part. The C horizon has hue of 10YR, value of 4 to 7 and chroma of 3 to 6. Common to many strata of darker and lighter materials occur. The percent of cemented sandy concretions in the upper C horizon range from 15 to 35 percent. The cementation may be due to combinations of calcium carbonate, OM, and iron. It is sand or gravelly sand.

COMPETING SERIES: There are no other series in this family.

GEOGRAPHIC SETTING: The Durados soils occur along the coast at elevations close to sea level, near the mouths of rivers flowing into the sea. Slope gradients range from 0 to 2 percent. The soil formed in coarse textured soil materials which consist of sand size shell fragments, and miscellaneous volcanic subrounded fragments. Some unknown mechanism causes the cementation of the sand into concretions and cemented layers. The climate is humid tropical. The average annual precipitation is 70 inches and the mean annual temperature ranges from 76 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Catano, Coloso and Toa soils, and the land type Coastal beaches. The Catano soils occur in similar geomorphic positions. The Coloso and Toa soils occur in river flood plains farther inland from the coast. The land type Coastal beaches are on narrow sandy strips closer to the sea.

DRAINAGE AND PERMEABILITY: Excessively drained; very slow runoff; rapid permeability.

USE AND VEGETATION: Mostly used for coconuts with an undergrowth pasture.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of very limited extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: San Juan Area, Puerto Rico; l974.

REMARKS: The Durados soils were included in mapping with the Catano soils.

Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - zone from 0 to 23 inches (A1, A2 horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION ESTACION PR

Established Series
Rev. RER
06/2002

ESTACION SERIES

The Estacion series consists of deep, well drained, moderately permeable soils. The formed in moderately fine textured sediments over gravel of mixed origin. These nearly level soils are on terraces and in floodplains. Slopes range from 0 to 2 percent. Mean annual precipitation is 70 inches and mean annual temperature is 78 degress F.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, active, isohyperthermic Fluventic Hapludolls

TYPICAL PEDON: Estacion silty clay loam - pasture
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark brown (10YR 3/3) silty clay loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few subrounded gravel, 1/2 to 2 inches in diameter; medium acid; clear smooth boundary. (6 to 12 inches thick)

A--8 to 20 inches; very dark grayish brown (10YR 3/2) gravelly clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; many fine to coarse gravel sized subrounded fragments; medium acid; gradual smooth boundary. (10 to 16 inches thick)
2C--20 to 50 inches; dark brown (10YR 4/3) gravelly sand; single grained; nonsticky, nonplastic; about 50 percent coarse gravel; many rounded cobbles 3 to 7 inches in diameter; slightly acid.

TYPE LOCATION: Turabo SCD, Puerto Rico, 0.5 mile northwest from kilometer marker 32.8 of highway 1, 50 feet east of the Bairoa River bank.

RANGE IN CHARACTERISTICS: The soil is slightly acid or medium acid. Depth to the skeletal layers ranges from 16 to 28 inches. Cobbles, 3 to 7 inches in diameter, range from few to many.

The A horizon has hue of 10YR or 7.5YR, value of 3 and chroma of 2 or 3. It is clay loam, silty clay loam, gravelly clay loam or gravelly silty clay loam. Gravel ranges from 5 to 20 percent by volume in the upper part to 15 to 30 percent in the lower part.

The 2C horizon has hue of 10YR, value of 4 or 5 and chroma of 3 through 6. Gravel ranges from 35 to 60 percent.

COMPETING SERIES: There is no other series in this family.

GEOGRAPHIC SETTING: The Estacion soils occur very close to the river banks on nearly level to gently sloping river flood plains with slope gradients ranging from 0 to 2 percent. The soil formed in stratified moderately fine textured sediments over gravelly layers of mixed origin. The climate is humid. The mean annual precipitation ranges from 60 to 80 inches and the mean annual temperature is 76 to 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bajura, Coloso, and Dique soils, all of which occur in the river flood plains of the humid areas. The Bajura and Coloso soils are poorly drained. The Dique soils lack the thick dark surface horizons and the gravelly lower C horizons.

DRAINAGE AND PERMEABILITY: Well drained; slow runoff; moderate permeability.

USE AND VEGETATION: Mostly used for pasture. Small area is in sugar cane.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - zone from 0 to 20 inches. (Ap and A horizon)

Contrasting materials at 20 inches.

National Cooperative Soil Survey
U.S.A.

LOCATION GUAYAMA PR

Established Series
Rev. JLL/GRB
06/2002

GUAYAMA SERIES

The Guayama series consists of shallow, well drained, moderately permeable soils on uplands. They formed in material that weathered from igneous rock. Near the type location, the mean annual precipitation is 35 inches and the mean annual temperature is 79 degrees F. Slopes range from 5 to 60 percent.

TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic, shallow Typic Haplustalfs

TYPICAL PEDON: Guayama very gravelly clay loam--pasture. (Color are for moist soil unless otherwise stated.)

A--0 to 5 inches; dark reddish brown (5YR 3/4) very gravelly clay loam; weak fine granular structure; friable; slightly sticky, plastic, many fine roots; about 40 percent, by volume, pebbles; neutral; clear smooth boundary. (2 to 8 inches thick)

Bt--5 to 12 inches; reddish brown (5YR 4/4) gravelly clay; moderate fine subangular blocky structure; friable; sticky, plastic; common fine roots; few faint clay films on faces of peds; coarse fragments coated with clay; about 25 percent, by volume, pebbles; neutral; clear smooth boundary. (4 to 9 inches thick)

BC--12 to 18 inches; yellowish red (5YR 4/6) very gravelly clay loam; weak fine subangular blocky structure; firm; slightly sticky, plastic; few fine roots; about 40 percent, by volume, pebbles; neutral; gradual irregular boundary. (2 to 6 inches thick)

R--18 inches; igneous bedrock; common coatings of secondary lime are in cavities and fractures.

TYPE LOCATION: Cabo Rojo Municipality, Puerto Rico. Approximately 0.7 miles southeast on P.R. Hwy 303 from the intersection of P.R. Hwy 301 and P.R. Hwy 303 on dirt road; about 200 feet southeast of dirt road. Cabo Rojo topographic quadrangle; lat. 17 degrees 59 minutes 23 seconds N.; long. 67 degrees 08 minutes 55 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Depth to semiconsolidated volcanic rock is 10 to 20 inches. Reaction is slightly acid to slightly alkaline throughout the profile.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is loam, clay loam, gravelly clay loam, or very gravelly clay loam.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay loam, clay loam, clay, gravelly clay loam, or gravelly clay.

The BC horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is clay loam, gravelly clay loam, or very gravelly clay loam.

The R layer is igneous bedrock. Coatings of secondary lime in fractures and cavities range from none to many.

COMPETING SERIES: There are no other series in the same family.

GEOGRAPHIC SETTING: The Guayama soils are on side slopes and ridges of dissected uplands. They formed in material that weathered from igneous bedrock. Slopes range from 5 to 60 percent. The climate is tropical semiarid. The average annual precipitation ranges from 30 to 40 inches and the average annual temperature ranges from 78 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Aguilita, Amelia, Jacana, and Maguayo soils. Aguilita soils have a mollic epipedon and are shallow to soft limestone bedrock. Amelia soils are very deep and have clayey-skeletal control sections. Jacana soils are moderately deep and have vertic properties. Maguayo soils are very deep and have secondary carbonates in the profile.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of Guayama soils are used as pasture. Vegetation includes Guinea grass, Pajon, Buffel grass, and other native and introduced grasses and shrubs.

DISTRIBUTION AND EXTENT: Semiarid uplands of Puerto Rico. This series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 5 inches (A horizon).

Argillic horizon - zone from 5 to 12 inches (Bt horizon).

Lithic contact - zone at 18 inches (R layer).

MLRA: 271.

National Cooperative Soil Survey
U.S.A.

LOCATION HUMACAO PR

Established Series
Rev. RAB:LHR:JEW
08/2000

HUMACAO SERIES

The Humacao series consists of deep, well drained soils formed in sediments derived from weathered volcanic rocks. They are gently sloping soils on terraces. Humacao soils have loam A horizons over sandy clay loam and clay loam B and C horizons.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Typic Hapludolls

TYPICAL PEDON: Humacao loam - sugar cane
(Colors are for the moist soil)

Ap--0 to 14 inches, dark brown (7.5YR 3/2) loam, few medium distinct brown (10YR 4/3) mottles; weak fine and medium granular structure; friable, nonsticky, slightly plastic; many fine roots; 2 percent fine subrounded rock fragments; many fine quartz crystals; few fine dark minerals; medium acid; clear smooth boundary. (8 to 18 inches thick)

B2--14 to 18 inches; brown (10YR 4/3) sandy clay loam, tongues of dark brown (7.5YR 3/2); weak fine subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; 5 percent fine subrounded rock fragments; common fine quartz crystals; common fine dark minerals; medium acid; clear smooth boundary. (4 to 10 inches thick)

C1--18 to 31 inches; yellowish brown (10YR 5/4) clay loam, common medium faint dark yellowish brown (10YR 4/4) mottles; massive; firm, slightly sticky, slightly plastic; few fine roots; common fine quartz crystals; 5 percent fine subrounded partially weathered rock fragments; few fine dark concretions; medium acid; clear smooth boundary. (8 to 16 inches thick)

C2--31 to 60 inches; yellowish brown (10YR 5/6) clay loam, many medium prominent dark brown (10YR 3/3) and common medium distinct yellowish red (5YR 5/8) mottles; massive; friable, slightly sticky, slightly plastic; few fine quartz crystals; 5 percent fine partially weathered rock fragments; common medium dark concretions; slight acid.

TYPE LOCATION: Este SCD, Puerto Rico; 0.1 mile south of kilometer marker 1.2 or Highway 908, 10 feet west of farm road.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 12 to 28 inches. Mean annual soil temperature ranges from 76 to 80 degrees F. Coarse fragment content ranges from 0 to 10 percent throughout. The soils are medium acid or slightly acid throughout. Base saturation of the soil ranges from 50 to 80 percent.

The A horizons have hues of 7.5YR or 10YR, values of 2 or 3, and chroma of 2 or 3. They are loam.

The B horizons have hues of 5YR to 7.5YR, values of 4 to 6, and chroma of 3 to 8. They are sandy clay loam, heavy loam or clay loam. They have weak fine to medium subangular blocky structure.

The C horizons have hues of 5YR to 7.5YR, values of 4 to 6, and chroma of 4 to 8. They are sandy clay loam, heavy loam or clay loam. They are massive.

COMPETING SERIES: There are no other known series in the same family.

The Dique, Estacion, Maraquez, Morado, Parasol, and Toa series are similar soils in related families. Dique, Maraquez, and Morado soils have ochric epipedons. Estacion and Toa soils have and argillic horizon and ustic moisture regimes.

GEOGRAPHIC SETTING: The Humacao soils are gently sloping on terraces above the river flood plains with slope gradients of 2 to 5 percent. The soils formed in medium and moderately fine textured sediments derived form soils of plutonic parent materials. The climate is humid tropical. The average annual rainfall ranges from 85 to 90 inches and the mean annual temperature from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Candelero, Coloso, Ingenio, Jaqueyes, Limones, Maunabo, and Vivi soils. Candelero soils are somewhat poorly drained. Coloso, Maunabo, and Vivi soils are on river

flood plains. Ingenio, Jaqueyes, and Limones soils are on sideslopes of the uplands at higher elevations.

DRAINAGE AND PERMEABILITY: Humacao soils are well drained and have medium runoff and moderate permeability.

USE AND VEGETATION: Major uses are for growing sugar cane and pasture. Native vegetation consists of grasses and brush.

DISTRIBUTION AND EXTENT: Humid plutonic areas of Puerto Rico. The series is of small extent with about 1,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

National Cooperative Soil Survey
U.S.A.

LOCATION HUMATAS PR

Established Series
Rev. GRB
06/2002

HUMATAS SERIES

The Humatas series consists of very deep, moderately slowly permeable, well drained soils on side slopes and ridges of strongly dissected uplands. They formed in clayey and loamy material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 78 inches and the mean annual temperature is about 75 degrees F. Slopes range from 5 to 60 percent.

TAXONOMIC CLASS: Very-fine, parasesquic, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Humatas clay - native pasture. (Colors are for moist conditions.)

Ap-- 0 to 4 inches; dark brown (7.5YR 4/4) clay; moderate fine granular structure; firm, slightly sticky, slightly plastic; many fine roots; very strongly acid; clear smooth boundary. (4 to 8 inches thick)

Bt1--4 to 9 inches; yellowish red (5YR 5/6) clay; moderate fine subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, plastic; many fine roots; few fine vesicular and tubular pores; few fine black particles; very strongly acid; clear smooth boundary.

Bt2--9 to 15 inches; red (2.5YR 5/8) clay; moderate fine and medium subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, plastic; common fine roots; few fine vesicular and tubular pores, very strongly acid; clear smooth boundary.

Bt3--15 to 25 inches; red (2.5YR 5/6) clay; weak fine subangular blocky structure; few faint clay films on faces of peds; firm; slightly sticky, slightly plastic; few fine roots; common fine vesicular and tubular pores; very strongly acid; clear

smooth boundary. (Total thickness of the Bt horizons ranges from 12 to 31 inches)

BC--25 to 32 inches; rubbed color red (2.5YR 5/6) silty clay loam; about 30 percent of this horizon consists of saprolite of variegated colors as: red (2.5YR 4/6), dark red (2.5YR 3/6), very pale brown (10YR 7/4), yellowish brown (10YR 5/8); weak fine and medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; many fine vesicular and tubular pores; very strongly acid; clear smooth boundary. (6 to 12 inches thick)

C1--32 to 45 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6); silty clay loam; massive; friable, nonsticky, slightly plastic; many fine pores; very strongly acid; clear smooth boundary.

C2--45 to 60 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6); saprolite that has a silty clay loam texture; massive; friable, nonsticky and slightly plastic; very strongly acid.

C3--60 to 96 inches; about 25 percent red (2.5YR 4/6), about 25 percent dark red (2.5YR 3/6), about 25 percent very pale brown (10YR 7/4), and about 25 percent yellowish brown (10YR 5/8), rubbed color is red (2.5YR 4/6) saprolite that has a clay loam texture; massive; very friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico. Approximately 6.5 miles northeast of the city of Mayaguez; about 660 feet on dirt road from kilometer marker 2.45 on Highway 406, and about 350 feet southwest of dirt road.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 22 to 51 inches. Reaction is very strongly acid or strongly acid. Rock fragments range from 0 to 20 percent, by volume throughout, except for the A horizon which can range to 40 percent by volume.

The A horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. Texture is silty clay loam, silty clay, clay, or their gravelly analogs.

The Bt horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay, clay, or their gravelly analogs.

The BC horizon has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8; or there is no dominant matrix color and are multicolored in shades of red, yellow, brown and gray. Texture is silty clay loam, silty clay, clay, or their gravelly analogs.

The C horizons has hue of 10R to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is silty clay loam, clay loam, clay, or their gravelly analogs.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Humatas soils are on side slopes and ridges of uplands. They formed in fine-textured residuum weathered from basic igneous rock. The climate is humid tropical. Slopes range from 5 to 60 percent. The average annual precipitation ranges from 70 to 86 inches and the average annual temperature ranges from 74 to 76 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Alonso, Consumo, Daguey, Lares, Los Guineos, and Zarzal soils. Alonso soils have oxidic control sections. Consumo soils are moderately deep to saprolite. Daguey soils have more clay in the control section and are Oxisols. The somewhat poorly drained Lares soils are on terraces at lower elevations. Los Guineos soils are on higher positions, are isothermic, have more clay in the control section, and are Oxisols. Zarzal soils have more clay in the control section and are Oxisols.

DRAINAGE AND PERMEABILITY: Well drained; moderately slowly permeability.

USE AND VEGETATION: Most areas of Humatas soils are used for pasture, food crops, and coffee production. Vegetation consists of native and introduced upland species.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Survey Area, Puerto Rico; 1968.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon).

Argillic horizon - zone from 4 to 25 inches (Bt horizons).

ADDITIONAL DATA: Characterization data are available for the typical pedon S61PR-8-1 and pedon S61PR-8-4, both are published in Soil Survey Investigation Report No. 12. Samples by NSSL, Lincoln, NE.

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION JAGUEYES PR

Established Series
Rev. BCD
07/2001

JAGUEYES SERIES

The Jagueyes series consists of very deep, moderately well drained, moderately permeable soils on side slopes and ridge tops of uplands. They formed in residuum of plutonic igneous rocks. Slopes range from 20 to 40 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine-loamy, kaolinitic, isohyperthermic Typic Kanhapludults

TYPICAL PEDON: Jagueyes sandy loam - cultivated. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark grayish brown (2.5Y 4/2) sandy loam; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common fine roots; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

A--8 to 14 inches; yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common fine roots; few medium black concretions; common fine shiny grains; many fine quartz grains; very strongly acid; clear smooth boundary. (4 to 8 inches thick)

Bt1--14 to 18 inches; yellowish brown (10YR 5/8) sandy clay loam with strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) coatings on surfaces of peds; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; few faint clay films, few medium black concretions; common fine black grains; many fine quartz grains; very strongly acid; clear smooth boundary. (3 to 6 inches thick)

Bt2--18 to 26 inches; yellow (10YR 7/6) clay loam with many fine distinct dark red (2.5YR 3/6) and many medium distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic;

common fine roots; many prominent clay films; few medium black concretions; few fine black grains; many fine quartz grains; many weathered feldspar grains; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bt3--26 to 37 inches; yellow (10YR 7/6) and red (2.5YR 4/8) clay loam with few fine faint brownish yellow (10YR 6/8) mottles; weak coarse subangular blocky structure; firm, nonsticky, slightly plastic; few fine roots; common distinct clay films; many fine quartz grains; few black grains; many weathered feldspar grains; very strongly acid; gradual smooth boundary. (8 to 14 inches thick)

Bt4--37 to 53 inches; red (2.5YR 4/8) sandy clay loam with brownish yellow (10YR 6/8) coatings; weak medium subangular blocky structure; friable; nonsticky, nonplastic; few fine roots, few faint clay films; many fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)

C1--52 to 71 inches; red (2.5YR 4/8) loam; massive; friable, nonsticky, slightly plastic; few fine black grains; many fine quartz grains; many fine weathered feldspar grains; very strongly acid; gradual wavy boundary. Fifty percent of this horizon consists of saprolite. (16 to 24 inches thick)

C2--71 to 95 inches; saprolite; red (2.5YR 5/8) loam; massive; friable, nonsticky, slightly plastic; very strongly acid; gradual smooth boundary. (18 to 28 inches thick)

C3--95 to 120 inches; saprolite red (2.5YR 5/6) sandy loam; massive; friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico, 7.5 kilometers southwest from Humacao; 7/7 kilometers north from Yabucoa; 1480 feet west from road junction at Mr. Ines Santiago's farm, Tejas Ward, Yabucoa. Seven hundred feet south of house and one hundred fifty feet NE of mango tree. Photo GS-LR-13-1103.

RANGE IN CHARACTERISTICS: Thickness of solum ranges from 39 to 60 inches. The soil ranges from strongly to extremely acid.

The A horizons have hues of 2.5Y or 10YR, values of 4 or 5, chromas of 2 through 6. The Ap horizon is sandy loam or loam.

The Bt horizons have dominant hues of 10YR or 7.5YR, values of 4 through 8 and chromas of 4 through 8. Mottles are common or many are red or dark red in color. Texture is sandy clay loam or clay loam. The structure ranges from weak to moderate subangular block. Clay films range from few faint to many prominent.

The C horizons have dominant red colors. They are sandy loam, loam, or sandy clay loam.

COMPETING SERIES: These are Aibonito, Alonso, Cialitos, Consumo, Corozal, Daguey, Ingenio, Limones, Lirios, Magens, Maricao, Moca, Rio Piedras, and Sabana Seca series. The Albonito, Cialitos, Daguey, and Limones soils have a higher content of organic matter in the argillic horizon. The Alonso and Ingenio soils have finer textured argillic horizons with more than 35 percent clay. The Consumo, Corozal, Lirios, Maricao, Moca, and Rio Piedras soils have higher cation exchange capacity--more than 24 meq/100 grams of clay - in their argillic horizons. The Magens soils are dry for more than 60 consecutive days during most years. The Sabana Seca soils are saturated with water during some part of the year and have dominant low chroma colors.

GEOGRAPHIC SETTING: The Jagueyes soils occur in sloping to steep sideslopes and narrow ridgetops. Slope gradients range from 20 to 40 percent. The soil formed in highly weathered residuum of plutonic igneous rocks, mainly quartz diorite and granodiorite. The climate is humid tropical. The average annual rainfall is from 75 to 85 inches and the mean annual temperature is from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ingenio and Lirios soils in addition to the Limones soils. The Limones soils occupy similar positions, but have argillic horizons with higher organic matter content.

DRAINAGE AND PERMEABILITY: Moderately well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Native pasture and shrubs. Used as pasture or planted to subsistence crops.

DISTRIBUTION AND EXTENT: Humid plutonic uplands. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Humacao, Puerto Rico; l972

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Orthoxic Tropudults to Fine-loamy, mixed, isohyperthermic Typic Hapludults. The previous OSED date was 7/73. The Jagueyes soils were included in the Jayuya series in the Soil Survey of Puerto Rico, l942.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 14 inches (Ap and A horizons)

Argillic horizon - zone from 14 to 53 inches (Bt horizons)

ADDITIONAL DATA: S63PR-12-10 Lincoln Laboratory data 19020-19028.

National Cooperative Soil Survey
U.S.A.

LOCATION JUNCAL PR

Established Series
Rev. BCD
08/2000

JUNCAL SERIES

The Juncal series consists of very deep, moderately well drained, moderately permeable soils on foot slopes and low rounded hill sides of uplands. They formed in limestone residuum. Slopes range from 5 to 20 percent. The mean annual precipitation is about 90 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Typic Hapludalfs

TYPICAL PEDON: Juncal clay - Brush. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark grayish brown (10YR 4/2) clay; weak coarse subangular block structure; firm, slightly sticky, plastic; many fine roots; medium acid; clear way boundary. (6 to 10 inches thick)

Bt1--8 to 14 inches; dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; few faint clay films; common fine roots; mildly alkaline; clear wavy boundary. (4 to 6 inches thick)

Bt2--14 to 20 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common distinct clay films; few fine roots; mildly alkaline; clear wavy boundary. (6 to 8 inches thick)

Bt3--20 to 33 inches; brownish yellow (10 YR 6/6) clay; common fine distint yellowish red (5YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few faint clay films; few black stains; mildly alkaline; clear wavy boundary. (8 to 14 inches thick)

Bt4--33 to 43 inches; brownish yellow (10YR 6/6) clay; common fine prominent red (2.5YR 5/6) mottles; moderate

medium and fine subangular blocky structure; firm, slightly sticky, plastic; few faint clay films; few fine roots; few black concretions; few black stains; neutrals; clear wavy boundary. 8 to 12 inches thick)

Bt5--43 to 49 inches; yellowish brown (10YR 5/6) clay; few fine prominent light greenish gray (5G 7/1) and few fine prominent red (2.5YR 5/6) mottles; moderate fine subangular blocky structure; firm, slightly sticky; few faint clay films; very few roots; few black stains; moderately alkaline; clear wavy boundary. (4 to 10 inches thick)

C--49 to 66 inches; brownish yellow (10YR 6/8) silty clay loam, many fine faint light gray (10YR 7/2) mottles; crushed color, yellow (10YR 7/8); massive; friable, slightly sticky, plastic; fine lime is from 25 to 35 percent of the horizons; strong effervescence.

TYPE LOCATION: Culebrinas SCD, Puerto Rico, 3 miles north of the town of San Sebastian; 2.4 kilometers on Highway 447 from junction of Highways 447 and 119; and 220 meters south on paved unnumbered road.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 36 inches to 60 inches. These soils are slightly sticky and plastic throughout.

The A horizon is in hues of 7.5YR or 10YR, in values of 4, and in chromas from 2 or 3. The A horizon is medium or slightly acid.

The Bt horizons have colors in hues of 7.5YR or 10YR, in values of 4 or 5, and chromas from 4, 6, or 8. Clay is the dominant texture in the solum and coarser in the C horizon. Structure ranges from moderate fine to medium subangular blocky. Reaction is mildly or moderately alkaline.

The C horizon is calcareous and effervescence ranges from slight to strong. Base saturation (by sum of cations) is more than 60 percent at 50 inches below the top of the argillic horizon.

COMPETING SERIES: These are the Machete, Rio Arriba, San Sebastian, and Tanama series. The Machete soils are redder, having hues of 5YR throughout their profiles. The Rio Arriba soils have cracks at some period during most years and clays with COLE values that exceed 0.09. The San Sebastian soils have more than 35 percent coarse fragments in their profiles and are calcareous throughout. The Tanama soils have hard rock within 20 inches of the soil surface.

GEOGRAPHIC SETTING: The Juncal series occur on footslopes and low rounded hills. Slope gradients range from 5 to 20 percent. The soil formed in fine textured residuum of limestone rocks. The climate is humid tropical. The average annual precipitation is 90 inches and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Colinas series. The Colinas soils are darker, shallower, and lack a well developed B horizon.

DRAINAGE AND PERMEABILITY: Moderately well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Most of the acreage is planted to sugar cane.

DISTRIBUTION AND EXTENT: Humid northern uplands of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: San Juan Area, Puerto Rico; l974

REMARKS: The classification was updated with the 4/91 draft from Fine, mixed, isohyperthemic Typic Tropudalfs to Fine, mixed, isohyperthermic Typic Hapludalfs. The previous OSED date was 3/91. This soil was formerly included in the Colinas series.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 8 inches (Ap horizon)

Argillic horizon - zone from 8 to 49 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION JUNCOS PR

Established Series
Rev. LHR
06/2002

JUNCOS SERIES

The Juncos series consists of deep, moderately well drained soils on sideslopes and footslopes. They formed in sediments derived from basic volcanic rocks. The Juncos soils typically have black slightly acid A horizons and dark brown and yellowish brown B and C horizons over volcanic rocks.

TAXONOMIC CLASS: Fine, smectitic, isohyperthermic Chromic Hapluderts

TYPICAL PEDON: Juncos clay - sugar cane
(Colors are for moist soil.)

Ap--0 to 8 inches; black (10YR 2/1) clay, common fine distinct yellow (10YR 7/6) mottles; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky, plastic; many fine roots; few fine black concretions; slightly acid; clear smooth boundary. (4 to 12 inches thick)

B2--8 to 18 inches; dark brown (7.5YR 4/4) clay, small amount of black (10YR 2/1) mixed throughout; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky, plastic; common fine roots; few pressure faces and slickensides; common fine black concretions; few subrounded volcanic fragments 1/4 to 1 inch in diameter; black coatings along root channels; neutral; gradual smooth boundary. (10 to 16 inches thick)

C1--18 to 31 inches; yellowish brown (10YR 5/6) clay; massive; firm, slightly sticky, plastic; common fine roots; pressure faces and slickensides; many fine black concretions; black coatings on root channels; few subrounded volcanic fragments 1/4 to 1 inch in diameter; neutral; gradual smooth boundary. (10 to 16 inches thick)

C2--31 to 40 inches; yellowish brown (10YR 5/6) clay; massive with thin clay stringers between cleavage plains; firm, slightly sticky, slightly plastic; few roots; 15 percent by volume of gravel size weathered volcanic rock; neutral; gradual wavy boundary. (7 to 11 inches thick)

R--40 inches, semi-consolidated volcanic rock.

TYPE LOCATION: Turabo SCD, Puerto Rico; 0.3 kilometer west of the town of Gurabo; Experiment Station Farm; 800 feet North of the SW corner of the substation.

RANGE IN CHARACTERISTICS: Solum thickness ranges for 12 to 24 inches. Depth to semi-consolidated volcanic rock is more than 3 feet. The soil ranges from medium acid to neutral in the solum and upper part of the C horizon and slightly acid or neutral in the rest of the C horizon. The soil ranges from 70 to 100 percent throughout and has COLE value of 0.09 to 0.13 in the solum. The mean annual soil temperature ranges from 72 to 78 degrees F.

The Ap horizons have hues of 10YR and 2.5Y, values of 2 and 3, and chroma of 1 and 2. They are clay.

The B horizons have hues of 7.5YR, values of 4 and 5, and chroma of 4 to 6. They are clay and have weak fine to medium subangular blocky structure. They have few to many slickensides and pressure faces.

The C horizons are clay and have few to many slickensides and pressure faces.

COMPETING SERIES: The Mabi and Mucara series are in the same family. Mabi soils have low chroma mottles int he B horizon. Mucara soils have bedrock within a depth of 36 inches.

The Caguabo, Dique, Junquitos, Malaya, Mani, Maraguez, Maresua, Montegrande, Morado, Pandura, Plata, Quebrada, and Vivi series are similar soils in related families. Caguabo and Malaya soils have hard rock, within a depth of 20 inches. Dique and Vivi soils are stratified. Junquitos and Mani soils have low chroma mottles. Maraquez, Maresua, Morado, Pandura, Plata, and Quebrada soils lack vertic properties. Montegrande soils have mixed mineralogy and gravelly layers.

GEOGRAPHIC SETTING: The Juncos soils are on side slopes and footslopes of strongly dissected uplands with slope gradients from 5 to 20 percent. The soils formed in fine textured residuum of extrusive basic volcanic rocks and to a

small degree from sediments from similar materials. The climate is humid topical. The average annual precipitation is 66 inches and the mean annual air temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Caguabo, Junquitos, Mabi, Montegrande and Mucara series.

DRAINAGE AND PERMEABILITY: Moderately well drained, runoff is medium to rapid, and permeability is slow.

USE AND VEGETATION: Sugar cane and pasture.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of minor extent with about 2,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.
REMARKS:

National Cooperative Soil Survey
U.S.A.

LOCATION LARES PR

Established Series
Rev. BCD
06/2002

LARES SERIES

The Lares series consists of very deep, somewhat poorly drained, moderately slowly permeable soils on dissected terraces. They formed in transported volcanic rocks. Slopes range from 2 to 20 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Very-fine, mixed, semiactive, isohyperthermic Aquic Paleudults

TYPICAL PEDON: Lares silty clay - sugar cane. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 9 inches; brown (10YR 4/3) silty clay; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; very strongly acid; clear smooth boundary. (5 to 10 inches thick)

Bt1--9 to 14 inches; light yellowish brown (10YR 6/4) and grayish brown (10YR 5/2) clay; weak medium subangular blocky structure; friable, slightly sticky, plastic; few faint clay films; common fine roots; few fine concretions; very strongly acid; clear smooth boundary. (4 to 7 inches thick)

Bt2--14 to 20 inches; light yellowish brown (10YR 6/4) clay with few fine prominent dark red (10YR 3/6), common fine faint very pale brown (10YR 7/3), and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, slightly sticky, plastic; many prominent clay films; few fine roots; common fine and medium partially weathered angular rock fragments; strongly acid; clear smooth boundary. (5 to 8 inches thick)

BC1--20 to 29 inches; yellowish brown (10YR 5/6) clay with few fine prominent dark red (10YR 3/6), few fine prominent red (10YR 4/8), and few fine faint light gray (10YR 7/2) mottles; weak fine and medium subangular blocky

structure; firm, slightly sticky, plastic; few fine roots; many weathered rock fragments; few hard slightly weathered angular rock fragments; very strongly acid; gradual smooth boundary. (8 to 10 inches thick)

BC2--29 to 45 inches; mixed yellowish brown (10YR 5/6), greenish gray (5GY 6/1) and yellowish brown (10YR 5/6) clay; yellowish brown (10YR 5/6) when crushed; weak coarse subangular blocky structure; firm, slightly sticky, plastic; very strongly acid; gradual smooth boundary. (12 to 18 inches thick)

C--45 to 71 inches; weathered rock fragments of variegated colors as yellowish brown (10YR 5/6), red (10YR 4/6), and greenish gray (5GY 6/1) clay; massive; friable, slightly sticky, slightly plastic; common fine hard rock fragments; very strongly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico. One mile northwest of the town of Anasco. Three hundred feet southeast of kilometer marker 143.6 of highway 2.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 34 to 53 inches. Thickness of the argillic horizon does not exceed 43 inches.

The A horizon is in hues of 7.5YR or 10YR, values of 4 and chromas of 3 or 4. Texture is silty clay loam, silty clay or clay. These soils have slightly sticky and slightly plastic A horizons. They are strongly or very strongly acid.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4, 5, or 6 an chroma of 4 and higher. They have red, yellow and brown mottles. Depth to mottles with chromas of 2 or less range from 18 to 30 inches of the soil surface. Clay films range from few faint to many prominent. Texture is clay and silty clay. Structure range from moderate to strong and from fine to medium. Wet consistence is slightly sticky and plastic. They are strongly or very strongly acid. Organic carbon content ranges from 1.0 to 1.4 percent in the upper 6 inches of the argillic horizon.

The mean annual soil temperature ranges from 75 to 78 degrees F.

COMPETING SERIES: These are the Naranjito and Picacho series in the same subgroup and Corozal, Daguao, and Los Guineos series. Daguao, Los Guineos, and Naranjito soils lack low chromas mottles in their profiles. In addition, Los Guineos soils are cooler and have yellower colors in the upper argillic horizon. The Corozal soils have less organic matter

and have low chroma mottles immediately below the A horizons. Picacho soils have cooler soil temperatures.

GEOGRAPHIC SETTING: The Lares soils occur on gently to moderately sloping dissected terraces on slope gradients from 2 to 20 percent. The soil formed in fine textured material in transported volcanic rocks. The climate is humid tropical. The average annual precipitation is 80 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Daguey, Humatas, and Consumo series. These soils occur on steeper slopes, have colors of redder hues and lack low chroma mottles in the argillic horizon.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; medium to slow runoff; moderately slow permeability.

USE AND VEGETATION: Most of the acreage is in sugar cane.

DISTRIBUTION AND EXTENT: Humid valleys of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; l936.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Aquic Tropudults to Clayey, mixed, isohyperthermic Aquic Hapludults. The previous OSED date was 6/71.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 9 inches (Ap horizon)

Argillic horizon - zone from 9 to 20 inches (Bt horizons)

Aquic feature - 2 chroma mottles in Bt1 horizon

National Cooperative Soil Survey
U.S.A.

LOCATION LIMONES PR

Established Series
Rev. BCD
07/2001

LIMONES SERIES

The Limones series consists of very deep, moderately well drained, moderately permeable soils on side slopes and ridge tops of uplands. They formed in residuum from plutonic rocks. Slopes range from 20 to 60 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 79 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Kandiudox

TYPICAL PEDON: Limones clay - pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 5 inches; dark yellowish brown (10YR 4/4) clay with few fine distinct strong brown (7.5YR 5/8) and olive gray (5Y 5/2) mottles; weak fine and medium subangular blocky structure; friable, nonsticky, plastic; common fine roots; red coatings along root channels; few fine quartz grains; very strongly acid; clear smooth boundary. (4 to 6 inches thick)

Bo1--5 to 9 inches; dark yellowish brown (10YR 4/4) clay with few fine faint strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; friable, nonsticky, plastic; common fine roots; few faint clay films; few fine quartz grains; few fine black grains; very strongly acid; clear smooth boundary. (4 to 10 inches thick)

Bo2--9 to 16 inches; yellowish brown (10YR 5/6) clay with many medium distinct red (2.5YR 4/8) mottles; moderate medium and coarse subangular blocky structure; firm, slightly sticky, plastic; common fine roots; many distinct yellowish brown clay films on surfaces of peds and root channels; common fine quartz grains; few fine black concretions; very strongly acid; clear smooth boundary. (5 to 9 inches thick)

Bo3--16 to 26 inches; yellowish red (5YR 5/6) clay; moderate medium and coarse subangular blocky structure; firm,

slightly sticky, plastic; common fine roots; many distinct strong brown clay films on surfaces of peds, root and worm channels; common fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. (8 to 12 inches thick)

Bo4--26 to 40 inches; yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, plastic; few fine roots; few faint strong brown clay films on surfaces of peds and root channels; few fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. Horizon consists of about 20 percent saprolite. (12 to 16 inches thick)

C1--40 to 54 inches; red (2.5YR 4/8) clay loam; massive; friable, nonsticky, plastic; few fine roots; thin clay films along root channels; many weathered feldspar grains; many fine quartz grains; very strongly acid; gradual smooth boundary. Horizon consists of saprolite. (10 to 16 inches thick)

C2--54 to 120 inches; variegated colors of the saprolite, red (2.5YR 4/8) rubbed color; silty clay loam; massive; friable, nonsticky, plastic; few fine roots, many fine quartz grains; common fine soft black grains; many weathered feldspar grains; very strongly acid.

TYPE LOCATION: Este SCD, Puerto Rico; 3 kilometers west of the town of Yabucoa, 100 feet north of kilometer marker 14.2 Highway 182, Aerial photo GS-LR-9-25.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 33 to 53 inches. The soil ranges from strongly through extremely acid. Organic matter content is 1.5 percent or more in the upper 6 inches of the argillic horizon.

The A horizon has colors in hues of 10YR or 7.5YR, values of 4 and chromas of 2 to 4. It is dominantly clay or silty clay loam.

The upper part of the Bo horizon has dominant colors in hues of 10YR, 7.5YR, or 5YR, values of 4 to 6 and chromas of 4 to 8. The lower part of the Bo horizon includes hue of 2.5YR. Texture is dominantly clay and the structure ranges from moderate medium to coarse subangular blocky. Clay films range from few faint to many prominent.

The C horizon consists of very highly weathered saprolite with variegated colors, friable and with common to many sand

sized quartz grains.

COMPETING SERIES: These are the Aceitunas, Aibonito, Alonso, Cialitos, Daguao, Daguey, Humatas, Ingenio, Jagueyes, Lares, Los Guineos, Magens, Naranjito, Sabana Seca, and Torres series. The Aceitunas and Torres soils have thicker argillic horizons. The Aibonito and Daguey soils have mixed mineralogy. The Alonso, Ingenio, and Jagueyes soils have lower organic matter values in the upper argillic horizon--less than 1.5 percent. In addition, the Alonso and Ingenio soils have redder colors in the Bt horizon and the Jaguey lacks the dark brown upper B horizon and is sandier. The Cialitos soils have oxidic mineralogy. The Daguao, Humatas, Los Guineos, and Naranjito soils have higher exchange capacity values in the argillic horizon--more than 24 meq/100 grams of clay. The Lares soils have low chroma mottles within 30 inches of the surface. The Magens soils are dry for more than 90 cumulative days and occur in areas with less than 40 inches of annual rainfall. The Sabana Seca soils are saturated with water some time of the year and have dominant low chroma colors.

GEOGRAPHIC SETTING: The Limones soils occur in strongly to moderately steep sideslopes and narrow ridgetops with slope gradients ranging from 20 to 60 percent. The soil formed in fine textured residuum of very highly weathered plutonic rocks. The climate is humid tropical. Average rainfall varies from 75 to 85 inches. The mean annual temperature is from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Los Guineos series in addition to the Ingenio, Jagueyes, Pandura, and Patillas series, all of which occupy similar land forms. The Ingenio soils have lower organic matter content in the argillic horizon. The Jagueyes soils have coarser textured profiles, with less than 35 percent clay. The Lirios soils have thinner argillic horizons. The Los Guineos soils occur at higher elevations above sea level and have lower soil temperatures. The Pandura and Patillas soils are underlaid by less weathered plutonic rocks.

DRAINAGE AND PERMEABILITY: Moderately well drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: Native grasses and brush. Used for minor crops and for pasture.

DISTRIBUTION AND EXTENT: Humid plutonic uplands. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Humacao Survey ARea, Puerto Rico; l972.

REMARKS: This classification was updated with the 4/91 draft from Clayey, kaolinitic, isohyperthermic Epiaquic Orthoxic Tropohumults to Very-fine, kaolinitic, isohyperthermic Humic Hapludox. The previous OSED was dated 7/73.

The Limones soils were included in the Jayuya series in the Soil Survey of Puerto Rico, l942.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 5 inches (Ap horizon)

Oxic horizon - zone from 5 to 40 inches (Bo horizons)

ADDITIONAL DATA: S63PR-12-2 Lincoln Laboratory data 19047-19055.

National Cooperative Soil Survey
U.S.A.

LOCATION LIRIOS PR

Established Series
Rev. BCD
08/2000

LIRIOS SERIES

The Lirios series consists of very deep, well drained, moderately permeable soils formed in materials weathered from Plutonic age. They are steep to very steep soils on side slopes and ridgetops of strongly dissected uplands. Slopes range from 3 to 60 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Fine, mixed, subactive, isohyperthermic Typic Hapludults

TYPICAL PEDON: Lirios silty clay loam - cultivated. (Colors are for moist soil.)

Ap--0 to 4 inches; dark brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable, nonsticky, slightly plastic; many fine roots; many fine quartz crystals; common fine dark concretions; very strongly acid; abrupt smooth boundary. (4 to 8 inches thick)

Bt1--4 to 14 inches; red (2.5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; few faint clay films on surfaces of peds and root channels; common fine quartz crystals; few fine white flakes; very strongly acid; gradual smooth boundary. (8 to 12 inches thick)

Bt2--14 to 23 inches; red (10R 4/6) silty clay with common fine distinct reddish yellow (5YR 6/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few faint clay films on surfaces of peds; common fine quartz crystals; many fine shiny white flakes; very strongly acid; gradual smooth boundary. (8 to 14 inches thick)

C--23 to 60 inches; variegated colors; red (10R 4/6), strong brown (7.5YR 5/8), reddish brown (5Y 4/3), pink (5YR 7/3); silty clay loam; massive; friable, nonsticky, slightly plastic; many fine quartz crystals; many fine shiny flakes; very strongly acid. This horizon consists of saprolite.

TYPE LOCATION: Este SCD, Puerto Rico, Barrio Guayabota, Municipality of Yabucoa; 150 feet south of kilometer marker 11.9 on Highway 181. Photo GS-LR 9-25.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 34 inches. Thickness of the argillic horizon varies from 16 to 26 inches. They are strongly or very strongly acid throughout. Quartz crystals vary from none to many. Base saturation by sum of cation ranges from 10 to 18 percent. Organic carbon content in the upper 6 inches of the argillic horizon varies from 0.6 to 0.9 percent. The mean annual soil temperature ranges from 76 to 78 degrees F.

The A horizon has hue of 5YR to 10YR, value of 4 and chroma of 3 or 4. Texture is silty clay loam or clay loam and is nonsticky and slightly plastic.

The Bt horizon has hue of 5YR to 10R, value of 4 or 5, and chroma of 6 and higher. It is clay or silty clay and consistence is slightly sticky and slightly plastic, clay films vary from few faint to many prominent.

The BC horizon, where present, has hue of 2.5YR or 10R with reddish yellow, yellowish brown or brownish yellow mottles.

The C horizons are silty clay loam, loam, or silt loam.

COMPETING SERIES: There are no other known series in the same family. The Consumo, Consojo, Corozal, Corozo, Ingenio, Jagueyes, Maricao, Moca, Patillas and Rio Piedras series are similar soils in related families. The Consumo, Maricao and Patillas soils have argillic horizons thinner than 16 inches. The Consejo soils are yellower and finer textured throughout. The Corozal soils are wetter and have low chroma mottles in the upper B horizons. The Corozo soils have sandy surface layers. The Ingenio and Jagueyes soils have lower CEC values, less than 24 meq/100 grams of clay.

GEOGRAPHIC SETTING: The Lirios soils are gently sloping to very steep soils on side slopes and narrow ridgetops. Slope ranges from 3 to 60 percent. The soil formed in fine over mucky-fine textured, very highly weathered residuum

weathered from plutonic rocks, mainly granodiorite or quartz diorite. The climate is humid tropical. The average annual precipitation ranges from 70 to 90 inches and the mean annual temperature ranges from 76 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ingenio soils in addition to the Pandura and Pellejas soils. The Pandura soils occur in similar positions but are shallow to less weathered plutonic rock. The Pellejas soils are thinner, coarser textured and lack argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: Original vegetation consists of native grasses and shrubs. The soils are used for pasture and food crops.

DISTRIBUTION AND EXTENT: Plutonic uplands. The series is of minor extent, about 28,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Humacao Area, Puerto Rico; 1968.

REMARKS: The classification was updated with the 4/91 draft from Clayey over loamy, mixed, isohyperthermic Typic Tropudults to Clayey, mixed, isohyperthermic Typic Hapludults. The previous OSED date was 7/85.

The diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon)

Argillic horizon - zone from 4 to 23 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION LOS GUINEOS PR

Established Series
BCD-HRM. Rev. GRB
07/2001

LOS GUINEOS SERIES

The Los Guineos series consists of very deep, well drained soils on side slopes of mountains. They formed in residuum from sandstone material. The mean annual precipitation is about 120 inches and the mean annual temperature is about 68 degrees F. Slopes range from 5 to 60 percent.

TAXONOMIC CLASS: Very-fine, kaolinitic, isothermic Humic Hapludox

TYPICAL PEDON: Los Guineos clay - forest. (Colors are for moist conditions.)

A--0 to 1 inch; dark yellowish brown (10YR 4/4) clay; moderate medium granular structure parting to moderate fine granular; firm; sticky, plastic; common very fine roots, many fine roots; few fine discontinuous tubular pores; many faint organic coats on vertical and horizontal faces of peds; extremely acid; clear smooth boundary. (1 to 5 inches thick).

Bt1--1 to 3 inches; yellowish brown (10YR 5/4) clay; moderate fine subangular blocky structure; firm; very sticky, very plastic; very few coarse, common fine and medium roots throughout; common very fine discontinuous tubular pores; few faint clay films on vertical and horizontal faces of peds; few worm casts; extremely acid; clear smooth boundary.

Bt2--3 to 9 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure parting to moderate coarse subangular blocky; firm; very sticky, very plastic; common fine and medium roots; common fine and medium discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; extremely acid; clear smooth boundary.

Bt3--9 to 18 inches; brownish yellow (10YR 6/6) clay; moderate coarse subangular blocky structure; firm; very sticky,

very plastic; common fine and medium roots; few fine discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; common fine distinct red (2.5YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bt4--18 to 31 inches; red (2.5YR 4/6) clay; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; very sticky, very plastic; few fine roots; few medium discontinuous tubular pores; many distinct clay films on vertical and horizontal faces of peds; few worm casts; many coarse distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; gradual smooth boundary. (Combined thickness of the Bt horizons range from 25 to 50 inches)

Bw1--31 to 43 inches; red (2.5YR 4/6) clay; weak coarse subangular blocky structure; firm; very sticky; very plastic; few fine roots; few medium discontinuous tubular pores; common distinct films on vertical faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; gradual smooth boundary.

Bw2--43 to 61 inches; strong brown (7.5YR 5/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few fine roots; few medium discontinuous tubular pores; common faint films on vertical faces of peds; many medium distinct yellowish red (5YR 4/6) and few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; clear smooth boundary.

Bw3--61 to 74 inches; strong brown (7.5YR 5/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few medium discontinuous tubular pores; common distinct coatings in root channels and/or pores; about 10 percent, by volume, saprolite; many medium distinct yellowish red (5YR 4/6) masses of iron accumulation; very strongly acid; gradual smooth boundary.

Bw4--74 to 93 inches; yellowish red (5YR 4/6) clay; weak very coarse subangular blocky structure; firm; sticky, plastic; few medium discontinuous tubular pores; about 10 percent, by volume, saprolite; very strongly acid. (Thickness of the Bw horizon is 50 to 80 inches).

TYPE LOCATION: Rio Grande Municipio, Noreste SWCD; Caribbean National Forest, Puerto Rico. Approximately 150 feet southwest of bridge on Road 911. El Yunque topographic quadrangle; lat. 18 degrees 18 minutes 47 seconds N.; long. 65 degrees 49 minutes 27 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness and depth to bedrock is more than 80 inches. Rock fragments range from 0 to 10 percent, by volume, throughout the profile. Reaction ranges from extremely acid to strongly acid throughout the profile. The lower depth of the Oxic horizon is above 50 inches. Stones and cobbles range from 0 to 15 percent on the surface.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is clay loam or clay.

The Bt horizon has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. Texture is clay loam or clay.

The Bo horizon, where present, has hue of 2.5YR to 10YR, value of 4 or 5 and chroma of 6 or 8. Texture is clay.

The Bw horizon has hue of 2.5YR to 7.5YR, value of 4 to 6 and chroma of 6 to 8. Texture is clay (using either 2.5 or 3 times the 15 bar water). Because of poor dispersion, the measured clay content ranges from 15 to 45 percent. Saprolite ranges from 0 to 20 percent, by volume, in the lower part.

COMPETING SERIES: There are no competing series in the same family.

GEOGRAPHIC SETTING: These soils are mountain sides or deeply dissected plateaus of uplands. They formed in residuum from sandstone material. The climate is humid tropical. Slopes range from 5 to 60 percent. The annual precipitation ranges from 100 to 140 inches and the average annual temperature ranges from 65 to 72 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Moteado, Yunque, and Zarzal soils. The poorly drained Moteado soils are deep to bedrock. The moderately well drained Yunque soils have less clay in the control section. The moderately well drained Zarzal soils have a kaolinitic control section.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Watershed protection, recreation, research, and wildlife habitat. Most of the areas are now forested.

DISTRIBUTION AND EXTENT: Upland areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1936.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 1 inch (A horizon).

Oxic horizon - zone from 1 to 31 inches (Bt horizons).

Cambic horizon - zone from 31 to 93 inches (Bw horizons).

LABORATORY DATA: Characterization data - Caribbean National Forest, Puerto Rico. Pedon No. 86P303 and Soil Survey No. S86PR-3-10. Sample by NSSL, Lincoln NE., February, 1986.

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION MABI PR

Established Series
Rev. LHR
07/2001

MABI SERIES

The Mabi series is a member of the fine, montmorillonitic, isohyperthermic family of Vertic Eutropepts. These soils have fine textured, sticky, plastic layers with pressure faces and slickensides that intersect.

TAXONOMIC CLASS: Very-fine, mixed, active, isohyperthermic Aquic Hapluderts

TYPICAL PEDON: Mabi clay - Guava orchard.
(Colors are for moist soil unless otherwise stated.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) clay with few fine faint yellowish brown mottles and red (2.5YR 4/6) coatings along root channels; weak fine granular structure; hard, very firm, slightly sticky, plastic; common fine roots; common fine black nodules; few fine fragments of volcanic rock; very strongly acid; clear smooth boundary. (6 to 12 inches thick)

B1--7 to 15 inches; dark yellowish brown (10YR 4/4) clay with few fine distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces; very firm, slightly sticky, plastic; common fine roots; few fine black nodules; few fine fragments of volcanic rock; strongly acid; clear wavy boundary. (6 to 12 inches thick)

B2--15 to 24 inches; yellowish brown (10YR 5/6) clay with many medium distinct gray (10YR 5/1) mottles; brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces and slickensides that intersect; very firm; slightly sticky, plastic; few fine roots; few fine black nodules; few fine fragments of volcanic rock; coatings along root channels; medium acid; clear wavy boundary. (8 to 12 inches thick)

C1--24 to 38 inches; yellowish brown (10YR 5/4) clay with few fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium and coarse angular blocky structure with many pressure faces and slickensides that intersect; very firm, slightly sticky, plastic; few fine black nodules; few fine fragments of volcanic rock; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary. (12 to 14 inches thick)

C2--38 to 53 inches; yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with common pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine fragments of volcanic rock; few fine and medium carbonatic concretions; mildly alkaline; gradual smooth boundary. (12 to 18 inches thick)

C3--53 to 67 inches; yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with few pressure faces and slickensides very firm, slightly sticky, plastic; few fine black nodules; few fine and medium fragments of volcanic rock; few fine carbonatic concretions; mildly alkaline; gradual wavy boundary. (10 to 18 inches thick)

C4--67 to 90 inches; auger sample-mixed yellowish brown (10YR 5/4) and greenish gray (5GY 6/1) clay; massive; very firm, slightly sticky, plastic; few fine black nodules; weak effervescence with dilute HCL; mildly alkaline. (15 to 30 inches thick)

C5--90 to 113 inches; auger sample-yellowish brown (10YR 5/6) clay with few medium distinct greenish gray (5GY 6/1) mottles; massive; very firm, slightly sticky, plastic; weak effervescence with dilute HCL; mildly alkaline.

TYPE LOCATION: Turabo SCD, Puerto Rico; 1.2 kilometers west of town of Gurabo. Eight hundred feet north and 600 feet west of Gurabo Experiment Station headquarters. Photo CS-LR 15-72.

RANGE IN CHARACTERISTICS: Depth to semiconsolidated volcanic rock is more than 5 feet. Distinct or prominent low chroma mottles occur within 20 inches of the surface. These soils have crack that open and close more than once during the year, but do not remain open for more than 90 cumulative days. There are years in which the soil may not crack. These soils are plastic throughout. The soil ranges from very strongly acid in the surface horizons through moderately alkaline in the lower C horizon.

The A horizon has a hue of 10YR, moist values of 3 or less, dry values of 5 or less, and chromas of 2 or more.

The B and C horizons have hues of 10YR or 2.5YR, values of 4 through 6, and chromas of 2 through 4.

COMPETING SERIES: These are the Camaguey, Cartegena, Fraternidad, Juncos, Montegrande, Mucara, Paso Seco, and Santa Isabel series. The Camaguey soils have chromas of less than 1.5 in the upper 12 inches. The Cartagena, Fraternidad, Paso Seco, and Santa Isabel soils all have cracks that open and close more than once during the year but remain open for more than 90 cumulative days during the year. The Juncos and Mucara soils are moderately deep to semiconsolidated volcanic rock. The Montegrande soils contain gravelly horizons within 40 inches of the surface.

GEOGRAPHIC SETTING: The Mabi soils occur in gently to moderately sloping alluvial fans and terraces above the river flood plains. The slope gradient ranges from 2 to 20 percent. The soil formed in fine textured sediments derived volcanic rocks. The climate is humid tropical. The average annual rainfall is 78 inches and the mean annual temperature is 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Gurabo, Juncos, Mucara, Montegrande, and Rio Arriba series. The Gurabo soils occupy similar positions in the landscape, but have gravelly horizons within 40 inches of the surface. The Rio Arriba soils have brighter colors and argillic horizons.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; medium to slow runoff; slow permeability.

USE AND VEGETATION: Sugar cane and pasture.

DISTRIBUTION AND EXTENT: Humid inner valleys of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The Mabi series was formerly classified in the Grumusols great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION MALAYA PR

Established Series
Rev. REG:LHR
06/2002

MALAYA SERIES

The Malaya series is well drained, moderately permeable soils formed in residuum from calcareous volcanic rocks. These soils have dark yellowish brown, and brown fine textured, non-calcareous A and B horizons and moderately fine textured C horizons over calcareous, semi- consolidated tuffaceous rocks.

TAXONOMIC CLASS: Clayey, mixed, superactive, isohyperthermic, shallow Typic Eutrudepts

TYPICAL PEDON: Malaya clay - native pasture.
(Colors are for moist soil.)

Ap--0 to 6 inches; dark yellowish brown (10YR 3/4) clay; weak medium granular structure; friable, slightly sticky, slightly plastic; many fine roots; few fine black concretions; common fine and medium rock fragments occupy 15 percent by volume of the horizons; slightly acid; clear smooth boundary. (5 to 7 inches thick)

B--6 to 12 inches; brown (10YR 4/3) gravelly clay with stringers of dark yellowish brown (10YR 3/4), crushed color dark grayish brown (10YR 4/2); weak medium subangular blocky structure; firm, sticky, plastic; common fine roots; common fine black concretions; common fine and medium rock fragments occupy 25 percent by volume of horizons; mildly alkaline; clear smooth boundary. (4 to 8 inches thick)

C--12 to 16 inches; dark yellowish brown (10YR 4/4) clay loam with common medium faint brown (10YR 5/3) mottles; crushed color brown (10YR 4/3); massive; firm, slightly sticky, slightly plastic; black coatings on faces; partially weathered rock fragments that can be crushed between fingers; moderatley alkaline; gradual wavy boundary. (3 to 5 inches thick)

R--16 to 20 inches plus; Semi-consolidated calcareous tuffaceous rock.

TYPE LOCATION: Suroeste SCD, Puerto Rico 2 miles north of the town of Hormigueros. 150 feet east of kilometer marker 1.2 on Highway 344.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 9 to 15 inches. Depth to the hard calcareous tuffaceous rock varies from 12 to 20 inches. Fine and medium volcanic rock fragments occupy 15 to 30 percent by volume of the horizons. Colors of the A and B horizons have hues of 5YR to 10YR, values of 3 and 4, and chormas of 4. Texture of the solum is clay.

The C horizons vary in textures from clay loam to silty clay loam. Structure of the B horizons ranges from weak fine to medium subangular blocky. These soils have slightly sticky and slightly plastic A horizons and sticky and plastic B horizons. Reaction of the A horizons ranges from medium to slightly acid and the B and C horizons from neutral to moderately alkaline. The base saturation (by NH4 OAc) is 50 percent or more in the epipedon and cambic horizon. Organic matter content decreases regulary with depth. Exchange capacity per 100 grams of clay (NH4 OAc) is more than 20 meg.

COMPETING SERIES: These are the Caguabo series in the same subgroup and the Cuchillas, Quebrada, Morado, Plata, Maresua, and Juncos series in the same great group. The Caguabo soils have more than 35 percent coarse fragments in the solum. The Cuchillas soils have lower soil temperatures (less than 71.6 degrees F.) and are not lithic. The Quebrada, Morado, and Maresu soils have semi-consolidated volcanic rocks deeper than 20 inches. The Plata soils have coarser textured, more acid deeper profiles. The Juncos soils have clays with high shrink-swell behavior and are not lithic.

GEOGRAPHIC SETTING: The Malaya soils occur on strongly sloping to steep side slopes of strongly dissected volcanic uplands on slope gradients of 20 to 60 percent. The regolith consists of fine textured residuum derived from calcareous volcanic rocks. The climate is humid tropical. The average annual precipitation is 75 inches and the mean annual temperature is 77 degrees F. Soil temperatures at depth of 20 inches is more than 22 degrees C. (71.6 degrees F.) and the difference between mean summer and winter temperature is less than 5 degrees C. (9 degrees F.).

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Quebrada, Maresua, Morado and Caguabo series in addition to the Mucara series. The Mucara soils are non-lithic and are underlain by noncalcareous volcanic

rocks.

DRAINAGE AND PERMEABILITY: Well drained, medium to rapid runoff, and moderate permeability.

USE AND VEGETATION: Pasture and brush.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The Malaya series was formerly classified in the Reddish Brown Lateritic Great Soil Group.

National Cooperative Soil Survey
U. S. A.

LOCATION MARICAO PR

Established Series
Rev. BCD
06/2002

MARICAO SERIES

The Maricao series consists of very deep, well drained, moderately permeable soils formed in material weathered from volcanic rocks. They are steep and very steep soils on strongly dissected uplands. Slopes range from 20 to 60 percent. The mean annual precipitation is about 110 inches and the mean annual temperature is about 72 degrees F.

TAXONOMIC CLASS: Fine, mixed, subactive, isohyperthermic Inceptic Hapludults

TYPICAL PEDON: Maricao clay -- native pasture. (Colors are for moist soil.)

Ap--0 to 5 inches; reddish brown (5YR 4/4) clay, some mixture of red (2.5YR 5/8) from underlying horizon; weak fine and medium subangular blocky parting to moderate medium granular structure; firm, slightly sticky, plastic; many fine roots; few worm channels; very strongly acid; clear smooth boundary. (4 to 7 inches thick)

Bt--5 to 14 inches, red (2.5YR 5/8) clay, coatings of light red (2.5YR 6/8) and yellowish red (5YR 5/8); weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few faint clay films; 10 percent of horizon is saprolite; 2 percent firm weathered rock fragments; very strongly acid; clear wavy boundary. (6 to 9 inches thick)

BC--14 to 20 inches; red (2.5YR 5/8) clay, and mixed colors from the saprolite; weak fine subangular blocky structure; friable, slightly sticky, palstic; few fine roots; 40 percent of horizon is saprolite; very strongly acid; clear wavy boundary. (5 to 12 inches thick)

C--20 to 60 inches; crushed color red (2.5YR 5/8) silty clay loam, variegated colors of saprolite; massive, saprolite; friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: Oeste SCD, Puerto Rico; 7.0 miles southeast of the town of Maricao; 2.3 kilometers on dirt road south of kilometer marker 44.5 of Highway 105; 25 meters west of dirt road.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 15 to 25 inches. Thickness of the argillic horizon ranges from 6 to 16 inches. Depth to semi-consolidated tuffs, mudstone or lava is more than 5 feet. The soil is extremely acid or very strongly aicd. The mean annual soil temperature ranges from 68 to 72 degrees F.

The A horizons have hues of 2.5YR or 5YR, values of 4 or 5, and chroma of 3 to 6. They are clay.

The Bt horizons have hues of 2.5YR or 5YR, values of 4 or 5, and chroma of 6 or 8. They are clay. Structure is weak fine or medium subangular blocky. The Bt horizon has 5 to 20 percent saprolite and the BC horizon has 20 to 60 percent saprolite.

The C horizon has crushed hues of 2.5YR or 5YR, values of 4 to 6, and chroma of 4 to 8. They are silty clay or silty clay loam.

COMPETING SERIES: Theser are no other know series in the same family.

The Ciales, Consumo, Corozal, Ingenio, Moca, Patillas, and Vega Alta series and similar soils in related families. All of these soils except Ciales soils have isohyperthermic temperature regimes. Ciales soils have argillic horizons thicker than 16 inches and have gray mottles.

GEOGRAPHIC SETTING: The Maricao soils are steep and very steep soils on strongly dissected uplands at elevations above 550 meters, with slope gradients of 20 to 60 percent. The soils formed in highly weathered residuum from basic volcanic rocks. The climate is humid tropical with annual precipitation that ranges from 90 to 120 inches and mean annual temperature of 70 to 74 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Ciales series and the Cuchillas, Los Guineos, Picacho, and Yunque soils. Cuchillas soils have a cambic horizon. Los Guineos and Yunque soils have hue of 10YR and mottles in the upper part of the B horizon. Picacho soils have low chroma mottles in the argillic horizon.

DRAINAGE AND PERMEABILITY: Well drained; rapid runoff; moderate permeability.

USE AND VEGETATION: Most of the acreage is in brushland or abandoned coffee plantations. Small acreage is used for growing native pasture, tame pasture, and coffee.

DISTRIBUTION AND EXTENT: Humid and high elevation areas of Puerto Rico. The series is of moderate extent with about 36,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, (Ponce Survey Area), 1971.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isothermic Dystropeptic Tropudults to Clayey, mixed, isothermic Ochreptic Hapludults with this draft. The previous OSED date was 5/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 5 inches (Ap horizon)

Argillic horizon - zone from 5 to 14 inches (Bt horizon)

Ochreptic feature - Bt horizon less than 10 inches thick.

National Cooperative Soil Survey
U.S.A.

LOCATION MARTIN PENA PR

Established Series
Rev. LHR
08/2000

MARTIN PENA SERIES

The Martin Pena series have black organic, slightly alkaline A horizons over moderately fine and fine textured, very dark brown upper C horizons and greenish gray and very dark brown, fine textured mottled lower C horizons.

TAXONOMIC CLASS: Fine, mixed, superactive, nonacid, isohyperthermic Humaqueptic Fluvaquents

TYPICAL PEDON: Martin Pena muck.
(Colors are for the moist soil unless otherwise stated.)

O2--0 to 8 inches; black (10YR 2/1) muck; weak fine granular structure; slightly sticky, slightly plastic; many fine living and decayed roots; mildly alkaline; abrupt smooth boundary. (6 to 10 inches thick)

C1--8 to 18 inches; very dark brown (10YR 2/2) silty clay loam with thin lenses of dark brown (10YR 4/3) organic material; massive; slightly sticky, slightly plastic; few fine and decayed roots; mildly alkaline; gradual smooth boundary. (8 to 12 inches thick)

C2--18 to 28 inches; very dark brown (10YR 2/2) clay; massive; slightly sticky, plastic; neutral, clear smooth boundary. (8 to 14 inches thick)

C3--28 to 55 inches; greenish gray (5G 5/1) clay with few fine faint very dark brown (10YR 2/2) dark greenish gray (5G 4/1) and gray (5G 6/1) mottles; massive slightly sticky, plastic; thin organic lenses; neutral; clear smooth boundary. (20 to 40 inches thick)

C4--55 to 63 inches; very dark brown (10YR 2/2) clay with few fine faint black (10YR 2/1) and greenish gray (5G 5/1) mottles; massive; slightly sticky, plastic; thin organic lenses; mildly alkaline.

TYPE LOCATION: San Juan SCD, Puerto Rico, 300 feet east of sentry box, entrance to the Sabana Seca Naval Communication Station, 30 feet north from center of paved unnumbered road.

RANGE IN CHARACTERISTICS: Surface horizon is in hues of 10YR or 7.5YR, values of 2 and chromas of less than 2.

The upper C horizon has colors in hue of 10YR and values and chroma of 2 or 3. It is silty clay loam or clay and mildly alkaline or neutral. The underlying C horizon has colors in hues of 5G, values of 4 or 5, and chromas of 1, with mottles of dark greenish gray or very dark brown. The lower C horizon has colors with hues of 10YR, values of 2 or 3, and chromas of 2 or 1. Mottles are black or greenish gray. The mineral materials may have thin organic layers at about 60 inches.

COMPETING SERIES: These are the Coloso, Fortuna, Pinones, and Vayas series. The Coloso and Vayas soils lack organic surface layers and organic lenses within the control section and Coloso soils are somewhat poorly drained. Fortuna soils are strongly acid. Pinones soils have buried organic materials within the control section and are very strongly acid.

GEOGRAPHIC SETTING: The Martin Pena soils occur in low depressional areas in the humid coastal plains and river flood plains. Slope gradients range from 0 to 2 percent. The surface layer is decomposed and partially decomposed organic herbaceous materials over fine textured mineral sediments. The temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Saladar, Bajura, and the competing Coloso series. The Saladar soils consist of thicker organic deposits throughout. The Bajura series lack the organic surface layers, and are not saturated most of the year by a high water table.

DRAINAGE AND PERMEABILITY: Very poorly drained; slow runoff; very slow permeability. Water table is at or near the surface during most of the year.

USE AND VEGETATION: Cattails, sedges, Pappirus, Para grass, and other water loving plants.

DISTRIBUTION AND EXTENT: Humid coastal plains and river flood plains of Puerto Rico. The series is if minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The Martin Pena series was classified in the Alluvial Great Soil Group. Studies are being made to determine if a new subgroup, Histic Tropic Fluvaquents, is needed to accommodate these soils.

National Cooperative Soil Survey
U.S.A.

LOCATION MATANZAS PR

Established Series
Rev. BCD
06/2002

MATANZAS SERIES

The Matanzas series consists of deep, well drained soils formed in sediments derived from limestone. They are nearly level and gently sloping soils on foot slopes and small valleys between limestone hills. Slopes range from 0 to 5 percent. The mean annual precipitation is about 64 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Clayey, kaolinitic, isohyperthermic Lithic Kandiustox

TYPICAL PEDON: Matanzas clay--native pasture. (Colors are for moist soil.)

Ap--0 to 14 inches; dark reddish brown (2.5YR 3/4) clay; moderate coarse granular structure; firm, slightly sticky, slightly plastic; common fine roots; few sand-size black aggregates; neutral; gradual smooth boundary. (10 to 16 inches thick)

Bo1--14 to 27 inches; dusky red (10R 3/4) clay; weak medium subangular blocky structure parting to moderate fine granular; friable, slightly sticky, plastic; many medium pores; comon fine roots; very fine granules in micro channels; neutral; gradual smooth boundary. (10 to 16 inches thick)

Bo2--27 to 44 inches; dark red (2.5YR 3/6) clay; weak coarse subangular blocky structure parting to moderate fine granular; friable, slightly sticky, plastic; many medium pores; common fine roots; very fine granules in micro channels; neutral; gradual smooth boundary. (10 to 16 inches thick)

R--44 to 46 inches; white hard limestone with fractures stained dark red.

TYPE LOCATION: Noroeste SCD, Puerto Rico; 125 feet east of kilometer marker 125 of highway 2; on south side of highway.

RANGE IN CHARACTERISTICS: Solum thickness and depth to limestone bedrock ranges from 40 to 50 inches. The soil ranges from medium acid to neutral. Base saturation of the oxic horizon ranges from 65 to 100 percent and cation retention ranges from 7.5 to 10 meg/100 g of clay. They are clay throughout with clay content ranging from 60 to 90 percent. The mean annual soil temperature ranges from 76 to 80 degrees F.

The A horizons have hues of 2.5YR and 5YR, value of 3, and chroma of 2 to 4.

The Bo horizons have hues of 10R and 2.5YR, values of 3 and 4, and chroma of 4 to 8. They have weak coarse to medium subangular blocky structure. They have slightly sticky and plastic consistence.

COMPETING SERIES: The Puhi series is in the same family. Puhi soils have less than 60 percent clay in the particle-size control section. The Bayamon, Catalina, Cotito, Coto, Delicias, Hanamaula, Lawai, Makapili, and Rosario series are similar soils in related families. Bayamon and Delicias soils have oxic horizons that extend to depths of more than 60 inches. Catalina, Coto, and Rosario soils have base saturation of less than 35 percent. Cotito soils have bedrock within a depth of 40 inches. Hanamaula, Lawai, and Makapili soils have umbric epipedons.

GEOGRAPHIC SETTING: The Matanzas soils are nearly level and gently sloping soils on foot slopes and small valleys between the limestone hills on slope gradients of 0 to 5 percent. The soils formed in fine textured sediments derived from limestone. Limestone outcrops are common in some areas. The climate is himid tropical. The average annual precipitation is 64 inches and the mean annual temperature 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Bayamon, Cotito, and Coto series and the Aceitunas and Tanama series. The Aceitunas soils are more acid and deeper than 60 inches to the hard limestone. The Tanama soils are yellower, have stronger structure in the B horizons and are shallower than 20 inches to the limestone.

DRAINAGE AND PERMEABILITY: Well drained, slow runoff and moderate permeability.

USE AND VEGETATION: Mostly used for growing food crops but a small acreage is in tame grasses and native

pasture.

DISTRIBUTION AND EXTENT: Northern coastal plains of Puerto Rico. The series is of minor extent, about 3,200 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, oxidic, isohyperthermic Tropeptic Eutrorthox to Very-fine, kaolinitic, isohyperthermic Lithic Eustrustox. The previous OSED date was 5/75.

Diagnostic horizons and features recognized in this pedon:

Umbric epipedon - zone from 0 to 14 inches (Ap horizon)

Oxic horizon - zone from 14 to 44 inches (Bo horizons)

Lithic contact - zone at 44 inches (R layer)

ADDITIONAL DATA: Characterization data are available for the typical pedon S61PR6-2 and pedon S63PR7-1 both of which are published in SSIR No. 12.

National Cooperative Soil Survey
U.S.A.

LOCATION MONTEGRANDE PR

Established Series
Rev. REG
07/2001

MONTEGRANDE SERIES

The Montegrande series have dark yellowish brown, fine textured A horizons and dark yellowish brown, low chroma mottled, fine textured B horizons that crack when dry over C horizons that have more than 35 percent coarse fragments by volume.

TAXONOMIC CLASS: Very-fine, mixed, superactive, isohyperthermic Chromic Hapluderts

TYPICAL PEDON: Montegrande clay - sugar cane (Colors are for moist soils unless otherwise stated.)

Ap--0 to 6 inches; dark yellowish brown (10YR 3/4) clay; weak medium subangular blocky structure with few pressure faces; firm, slightly sticky, plastic; many fine roots; common fine volcanic fragments; few fine black concretions; strongly acid; clear smooth boundary. (5 to 8 inches thick)

B1--6 to 10 inches; dark grayish brown (10YR 4/2) clay; weak medium subangular blocky structure with pressure faces; firm, slightly sticky, plastic; common fine roots; few fine volcanic fragments; common fine black concretions; strongly acid; clear wavy boundary. (4 to 9 inches thick)

B2--10 to 14 inches; dark yellowish brown (10YR 3/4) clay with many fine distinct yellowish brown (10YR 5/6, 5/4, 5/8), and gray (10YR 5/1) mottles; moderate medium angular blocky structure with pressure faces and slickensides; firm, slightly sticky, plastic; few fine roots; many fine and few medium volcanic fragments; many fine black concretions; strongly aid; clear smooth boundary. (4 to 8 inches thick)

B3--14 to 24 inches; yellowish brown (10YR 5/6) clay with many medium distinct gray 910YR 5/1) mottles; crushed color dark yellowish brown (10YR 4/4), weak medium angular blocky structure with slickensides; few fine roots; many sand size volcanic fragments; few fine white concretions; many fine black concretions; mildly alkaline; clear smooth boundary. (7 to 11 inches thick)

11C1--24 to 32 inches; yellowish brown (10YR 5/6) gravelly clay with many medium distinct gray (10YR 5/1) and few fine distinct grayish brown (10YR 5/2) mottles; massive; friable; slightly sticky, slightly plastic; volcanic fragments 1/8 to 1 inch and many fine black concretions; mildly alkaline; clear smooth boundary. (7 to 15 inches thick)

11C2--32 to 60 inches; gray (10YR 5/1) gravelly clay with many medium distinct yellowish brown (10YR 5/6) and gray (5YR 5/1) mottles; dark brown (7.5YR 4/2) crushed; massive; friable, slightly sticky and nonplastic; volcanic fragments 1/4 to 1/2 inch in size make up more than 60 percent of the horizon; many fine black and few fine white concretions; moderately alkaline. There are thin lenses and strata of fine material interbedded.

TYPE LOCATION: Suroeste SCD, Puerto Rico, 5.0 miles west of the town of San German; 150 feet south on dirt road from kilometer marker 5.3 of Highway 102; 20 feet west of dirt road.

RANGE IN CHARACTERISTICS: Thickness of solum and depth to the gravelly horizons varies from 20 to 36 inches.

The A horizons have hues of 10YR, values of 3 or 4, and chromas of 2, 3, or 4.

The B2 horizons have hues of 10YR or 2.5Y with low chroma mottles. Clay is the dominant texture throughout.

From 50 to 70 percent by volume of the lower C horizons consists of volcanic fragments that range in size from 1/8 to 1 inch.

Pressure faces are present in the A horizons. The B2 horizons have cracks during the dry season, and slickensides. Reaction in the upper B horizons ranges from strongly to medium acid in the C horizons from annual soil temperature ranges from 73 to 78 degrees F.

COMPETING SERIES: These are the Gurabo, Juncos, and Mucara series in the same subgroup and Jacana, Llanos, Maguayo, and Parcelas series. The Gurabo soils have loamy textures in the lower half of the control section. The Juncos soils have montmorillonitic mineralogy and have semi-consolidated volcanic rocks below 20 inches. The Mucara soils and Maguayo soils are drier with ustic soil moisture regimes. The Parcelas soils have base saturations below 50 percent.

GEOGRAPHIC SETTING: The Montegrande soils occur on alluvial fans and foot slopes of volcanic hills with slope gradients of 2 to 12 percent. The soil formed in stratified fine textured sediments over gravelly strata washed from the surrounding volcanic hills. The climate is humid tropical, the average annual precipitation is 76 inches, and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Caguabo series in addition to the competing Mucara series. The Caguabo series has hard rock within 20 inches. Both series occur in adjacent higher positions in the landscape.

DRAINAGE AND PERMEABILITY: Moderately well drained; medium runoff; moderately slow permeability.

USE AND VEGETATION: Most of the acreage is in sugarcane.

DISTRIBUTION AND EXTENT: Humid inner valleys of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.

REMARKS: This is a format update only performed by the NSSQA Staff on 8/89.

The soil was formerly classified in the Reddish Prairie great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION MORADO PR

Established Series
Rev. REG:LHR
06/2002

MORADO SERIES

The Morado series consists of moderately deep, well drained soils formed in materials weathered from volcanic rocks. They are moderately steep to very steep soils on side slopes and ridgetops of the dissected uplands. They are friable clay loam in the A and B horizons over loam saprolite of variegated colors. Semi-consolidated volcanic rock is at 33 inches.

TAXONOMIC CLASS: Fine, mixed, superactive, isohyperthermic Dystric Eutrudepts

TYPICAL PEDON: Morado clay loam - pigeon peas.
(Colors are for moist soil.)

Ap--0 to 7 inches; dark reddish gray (10YR 4/1) clay loam; weak fine subangular blocky structure; friable, slightly sticky, plastic; common fine roots; neutral; clear smooth boundary. (4 to 7 inches thick)

B2--7 to 17 inches; reddish gray (5YR 5/2) clay loam with few fine faint weak red (2.5YR 4/2), yellowish red (5YR 4/6) and reddish brown (5YR 4/3) mottles; weak fine subangular blocky structure breaking to weak fine granular; friable, slightly sticky, plastic; common fine roots; slightly acid; gradual wavy boundary. (6 to 11 inches thick)

B3--17 to 24 inches; variegated colors, brown, dark brown (7.5YR 4/2), dark reddish gray (5YR 4/2) and dark gray (5YR 4/1) clay loam; weak fine subangular blocky structure; friable, slightly sticky, plastic; few fine roots; slightly acid; clear wavy boundary. (6 to 12 inches thick)

C--24 to 33 inches; variegated colors; brown, dark brown (7.5YR 4/2), dark reddish gray (5YR 4/2) and dark gray (5YR 5/1) loam; massive; friable, slightly sticky, slightly plastic; slightly acid. (6 to 12 inches thick)

R--33 plus inches ; reddish gray, semi-consolidated volcanic rock.

TYPE LOCATION: Oeste SCD, Puerto Rico; 6.5 miles northwest of the city of Mayaguez; 500 meters on dirt road from kilometer marker 3.85 on Highway 406 and 100 feet north of dirt road.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 16 to 30 inches. Depth to the semi-consolidated volcanic rock varies from 22 to 42 inches. These soils are slightly sticky and plastic or slightly plastic throughout. The mean annual soil temperature ranges from 74 76 degrees F.

The A horizon has hues of 5YR to 10R, values of 4 or 5, and chroma of 1 or 3. It is clay loam or silty clay loam. Consistence is slightly sticky and plastic or slightly plastic. Reaction is neutral or slightly acid.

The B2 horizon has hues of 5YR to 2.5YR, values of 4 or 5, and chromas of 2 to 4. Some pedons have weak red, yellowish red and reddish brown mottles. Texture varies from clay loam to silty clay loam. Structure of the B2 horizon when present has 40 to 50 percent saprolite. Reaction varies from medium acid to neutral.

The C horizon is loam or clay loam.

COMPETING SERIES: The Maraguez series is in the same family. The Maraguez soils are deeper in the semi-consolidated rock and have yellower colors in hue of 10YR. The Caguabo, Juncos, Junquitos, Mabi, Malaya, Maresua, Montegrande, Mucara, Pandura, Plata and Quebrada are the soils in similar familes. Caguabo and Malaya soils are shallower to the volcanic rocks. The Juncos, Mabi, Montegrande, and Mucara soils are all finer textured and have higher COLE value. The Junquitos soils are finer textured and have low chroma mottles. The Maresua soils are finer textured and are gravelley throughout. The Pandura soils are coarser textured throughout. The Plata soils have more than 35 percent by volume of gravel. The Quebrada soils have finer soil texture throughout.

GEOGRAPHIC SETTING: The Morado soils are strongly sloping to very steep soils on side slopes and ridgetops of dissected uplands with slope gradients of 12 to 60 percent. The soil formed in moderately fine and medium textured residuum weathered from volcanic rocks. The climate is humid tropical. The average annual precipitation is 88 inches and the mean annual temperature is 76 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Caguabo, Maraguez, Mucara, and the Quebrada series. All of these soils occur in similar positions.

DRAINAGE AND PERMEABILITY: Well drained; rapid runoff; moderate permeability.

USE AND VEGETATION: Coffee, pasture and brush.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of moderate extent about 34,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.

ADDITIONAL DATA: Characterization data are available of the typical pedon. S61PR-8-2.

National Cooperative Soil Survey
U. S. A.

LOCATION MUCARA PR

Established Series
Rev. GRB
06/2002

MUCARA SERIES

The Mucara series consists of moderately deep, well drained soils on side slopes of strongly dissected uplands. They formed in material that weathered from igneous rocks. Near the type location, the mean annual precipitation is about 78 inches and the mean annual temperature is about 76 degrees F. Slopes range from 15 to 70 percent.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, isohyperthermic Dystric Eutrudepts

TYPICAL PEDON: Mucara clay - pasture. (Colors are for moist soil)

Ap--0 to 6 inches; very dark grayish brown (10YR 3/2) clay; weak medium granular structure; firm, slightly sticky, plastic; few fine black (10YR 2/1) concretions; many fine roots; moderately acid; clear smooth boundary. (4 to 8 inches thick)

Bw--6 to 12 inches; about 50 percent very dark grayish brown (10YR 3/2) and about 50 percent brown (10YR 5/3) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots along structural faces; few distinct pressure faces on surfaces of peds; slightly acid; abrupt irregular boundary. (6 to 12 inches thick)

C--12 to 22 inches; brown (10YR 4/3) loam; massive; friable; slightly sticky, slightly plastic; few fine roots; about 30 percent, by volume, saprolite; few distinct tongues of B material; neutral; gradual wavy boundary. (10 to 16 inches thick)

R--22+ inches; semi-consolidated igneous rock.

TYPE LOCATION: Suroeste SCD, Puerto Rico. Approximately 1.5 miles east of bridge of Highway 2 over the

Rosario River and about 100 feet north of the highway.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 10 to 20 inches. Rock fragments range from 0 to 15 percent, by volume. Depth to semi-consolidated rock ranges from 20 to 40 inches. Reaction ranges from moderately acid to neutral in the A and Bw horizons and slightly acid or neutral in the C horizon.

The A horizon has hue of 5YR to 2.5Y, value of 2 to 5, and chroma of 2 to 4. Texture is silty clay loam, silty clay, or clay.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 6. Texture is clay loam, silty clay, or clay.

The BC horizon, where present, has colors and textures similar to the Bw horizon.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4; or there is no dominant color and is multicolored in shades of brown, yellow, and gray. Texture is loam or clay loam.

The R layer is semi-consolidated igneous rock.

COMPETING SERIES: There no competing series in the same family.

GEOGRAPHIC SETTING: Mucara soils are on side slopes of strongly dissected uplands. They formed in fine-textured residuum weathered from basic igneous rock. The climate is humid tropical. Slopes range from 15 to 70 percent. The average annual precipitation ranges from 75 to 80 inches and the average annual temperature ranges from 75 to 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Caguabo, Maraguez, Morado, and Quebrada series. These soils are on similar landscape positions. In addition, Caguabo soils are shallow to bedrock, Maraguez soils are very deep and have less clay in the subsoil, Morado soils have less clay in the subsoil, and Quebrada soils are very deep and have mixed mineralogy in the control section.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Many areas of Mucara soils are used for growing sugarcane, food crops, coffee, and pastureland. Some areas are in woodland. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of major extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1942.

REMARKS: Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - the zone from 0 to 6 inches (Ap horizon).

Cambic horizon - the zone from 6 to 12 inches (Bw horizon).

MLRA: 270.

National Cooperative Soil Survey
U.S.A.

LOCATION NARANJITO PR

Established Series
Rev. BCD
08/2000

NARANJITO SERIES

The Naranjito series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from volcanic rocks. They are moderately steep to very steep soils on sideslopes and ridgetops of dissected uplands. Slopes range from 12 to 60 percent. The mean annual precipitation is about 88 inches and the mean annual temperature is about 76 degrees F.

TAXONOMIC CLASS: Fine, mixed, semiactive, isohyperthermic Typic Haplohumults

TYPICAL PEDON: Naranjito silty clay loam - native pasture. (Colors are for moist soil.)

A--0 to 7 inches; dark brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; common fine roots; thin clay films on root channels; 5 percent 1/4 to 1 inch volcanic rock fragments; extremely acid; clear smooth boundary. (5 to 10 inches thick)

Bt1--7 to 20 inches; yellowish red (5YR 4/6) clay; weak fine subangular blocky structure; very hard, firm, slightly sticky, plastic; few fine roots; few faint dark brown (10YR 3/3) clay films; 10 percent angular 1/8 to 2 inch volcanic rock fragments; very strongly acid; gradual smooth boundary. (10 to 16 inches thick)

Bt2--20 to 30 inches; yellowish red (5YR 4/6), and yellowish brown (10YR 5/4) clay; weak fine subangular blocky structure; very hard, firm, slightly sticky, plastic; common distinct dark brown (10YR 3/3) clay films on faces of peds, along root channels and worm holes; 10 percent 1/8 to 2 inch angular volcanic rock fragments; 40 percent by volume is saprolite; very strongly acid; gradual smooth boundary. (4 to 15 inches thick)

C--30 to 38 inches; yellowish red (5YR 4/6), red (2.5YR 4/6) , and light olive brown (2.5Y 5/4) clay loam; massive; hard, firm, slightly sticky, plastic; common fine dark concretions; 15 percent 1/8 to 3 inch angular rock fragments; saprolite; very strongly acid; abrupt smooth boundary. (0 to 14 inches thick)

R--38 inches; semi-consolidated volcanic rock.

TYPE LOCATION: Barrio Jacaboa, Patillas, Puerto Rico; 150 feet southwest of kilometer marker 3.5, Highway 758.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 40 inches and depth to semi-consolidated rock ranges from 25 to 40 inches. Angular gravel fragments, 1/8 to 2 inches in size, range from 5 to 15 percent by volume throughout the soil. The soil ranges from strongly acid to extremely acid throughout. Mean annual soil temperature ranges from 76 to 80 degrees F.

The A horizons have hues of 7.5YR or 10YR, values of 4 or 5, and chroma of 3 or 4. They are silty clay loam.

The Bt horizons have hues or 5YR or 7.5YR, values of 4 to 6, and chroma of 4 to 8. They are clay and have weak or moderate, fine or medium subangular blocky structure. They have few faint or common distinct clay films.

The C horizon has variegated colors. It is clay loam or silty clay loam and has slightly plastic or plastic consistence.

COMPETING SERIES: The Daguao series is in the same family. Daguao soils have hue of 10YR in the B horizon and crystals of hornblende.

The Alonso, Aibonito, Ciales, Cidral, Daguey, Humatas, Lares, Limones, Lirios, Los Guineos, Picacho, Rio Piedras, and Voladora series are similar soils in related families. Alonso, Aibonito, Daguey and Limones soils have CEC values between 16 and 24 meg/100 grams of clay. The Ciales, Lares and Picacho soils have low chroma mottles in the B horizon. Cidral soils have sola thicker than 60 inches. Humatas and Rio Piedras soils have kaolinitic mineralogy. Lirios soils have clayey over loamy particle-size control sections. Los Guineos soils have hues of 10YR in the upper part of the B horizon. Voladora soils are Rhodudults.

GEOGRAPHIC SETTING: The Naranjito soils are moderately steep to very steep on sideslopes and ridgetops of

strongly dissected volcanic uplands. Slopes range from 12 to 60 percent. The soils formed in moderately fine to fine textured residuum weathered from volcanic rocks. The climate is humid tropical. The average annual rainfall ranges from 75 to 100 inches, and the average annual temperature is from 74 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Daguey and Humatas series and the Consumo and Mucara soils, all of which are on similar volcanic sideslopes and ridgetops. The Consumo soils have thinner argillic horizons. The Mucara soils lack argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid. Permeability is moderate.

USE AND VEGTATION: Most of the soil is in native grasses and shrubs. Small areas are used for growing subsistence crops and tame grasses.

DISTRIBUTION AND EXTENT: Humid volcanic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, (Soil Survey), 1942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Typic Tropohumults to Clayey, mixed, isohyperthermic Typic Haplohumults. The previous OSED date was 5/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 7 inches (A horizon)

Argillic horizon - zone from 7 to 30 inches (Bt horizons)

Lithic feature - zone at 38 inches (R layer)

National Cooperative Soil Survey
U.S.A.

LOCATION PANDURA PR

Established Series
Rev. RAB-LHR
06/2002

PANDURA SERIES

The Pandura series consists of shallow, well drained soils formed in materials weathered from plutonic rocks. They are moderately steep to very steep soils on side slopes of dissected uplands. They have loam to sandy loam A and B horizons over weathered and partially weathered plutonic rocks.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, isohyperthermic, shallow Dystric Eutrudepts

TYPICAL PEDON: Pandura loam - pasture
(Colors are for moist soil.)

Ap--0 to 3 inches; dark brown (10YR 3/3) loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many fine roots; many fine quartz grains; many worm casts; strongly acid; clear smooth boundary. (3 to 6 inches thick)

B2--3 to 7 inches; dark grayish brown (10YR 4/2) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic, many fine roots; few thin patchy clay films on surfaces of peds; many fine quartz grains; many worm casts; many fine dark colored weathered minerals; strongly acid; gradual smooth boundary. (3 to 5 inches thick)

B3--7 to 15 inches; light olive brown (2.5Y 5/4) sandy loam; massive; friable; nonsticky, nonplastic; few fine roots; many fine quartz grains; medium acid; gradual wavy boundary. (6 to 9 inches thick)

C1--15 to 19 inches; light olive brown (2.5Y 5/4) sandy loam; massive; friable; nonplastic; very few fine roots; slightly acid; gradual wavy boundary. (0 to 8 inches thick)

C2r--19 to 35 inches; partially weathered igneous rock of sandy loam texture; rock structure; friable; slightly acid.

TYPE LOCATION: Sudeste SCD, Puerto Rico; 150 feet northeast of kilometer marker 23.9 of Highway 181.

RANGE IN CHARACTERISTICS: Solum thickness and depth to the paralithic contact ranges from 12 to 20 inches. Mean annual soil temperature ranges from 76 to 80 degrees F. Base saturation below a depth of 10 inches is more than 80 percent. The soil has common or many fine quartz grains throughout.

The A horizons have hues of 7.5YR and 10YR, values of 3 and 4, and chroma of 3 and 4. They are loam or sandy loam.

The B horizons have hues of 7.5YR through 2.5Y and values and chromas of 3 to 6. They are loam or sandy loam and have weak medium or fine subangular blocky structure or subhorizons are massive.

The C horizons have hues of 10YR or 2.5Y, values of 5 through 7, and chroma of 3 through 6. They are loam or sandy loam.

COMPETING SERIES: There are no other known series in the same family. The Caguabo, Cuchillas, Dique, Juana Diaz, Juncos, Junquitos, Malaya, Mani, Maraguez, Maresua, Montegrande, Morado, Mucara, Plata, Quebrada, and Vivi series are similar soils in related families. Caguabo and Malaya soils have hard rock within a depth of 20 inches. Cuchillas soils have an isothermic temperature regime. Dique and Vivi soils have an irregular decrease in organic matter with depth. Juana Diaz soils have an ustic moisture regime. Juncos, Montegrande, and Mucara soils have higher COLE values and crack when dry. Junquitos and Mani soils have low chroma mottles. Maraguez, Morado, and Quebrada soils lack a paralithic contact within a depth of 20 inches. Maresua and Plata soils have more than 35 percent coarse fragments in the particle-size control section.

GEOGRAPHIC SETTING: The Pandura soils are sloping to steep and on side slopes of dissected uplands. Slope gradients range from 20 to 60 percent. The soils formed in loamy residuum from partially weathered plutonic rocks, mainly quartz diorite and granodiorite. The climate is humid tropical. The average yearly precipitation is 75 to 85 inches and the mean annual air temperature is 76 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Candelero, Cayagua, Ingenio, Jagueyes, Limones,

Lirios, Mayo, Patillas and Teja series. The Candelero, Cayagua and Mayo soils occur in terraces and footslopes and have thicker profiles. The Ingenio, Jagueyes, Limones, Lirios, Patillas and Teja soils are in similar side slopes. The Ingenio, Jagueyes, Limones, Lirios and Patillas soils are more weathered and have redder profiles. The Teja soils have hard rock within 20 inches of the surface.
DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid. Permeability is moderately rapid.

USE AND VEGETATION: Principal use is for growing pasture of native grasses and tame. Small acreage is in food crops.

DISTRIBUTION AND EXTENT: Humid plutonic uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

National Cooperative Soil Survey
U.S.A.

LOCATION PELLEJAS PR

Established Series
Rev. REG
06/2002

PELLEJAS SERIES

The Pellejas series have dark grayish brown, granular, clay loam A horizons and dark brown, clay loam B horizons over thick, light brownish gray, loamy sand C horizons.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic Typic Dystrudepts

TYPICAL PEDON: Pellejas clay loam - native pasture.
(Colors are for moist soil unless otherwise stated.)

Ap--0-5 inches; Dark grayish brown (10YR 4/2) clay loam; moderate fine granular structure; firm, slightly sticky, slightly plastic, many fine roots, many fine quartz grains; strongly acid; clear smooth boundary. (4 to 6 inches thick)
B2--5-11 inches; Dark brown (10YR 4/3) clay loam; weak medium subangular blocky structure; firm, slightly sticky, plastic, many fine roots; common fine and few medium quartz grains; strongly acid; clear wavy boundary. (4 to 9 inches thick)

B3--11-15 inches; Pale brown (10YR 6/3) 60 percent, dark yellowish brown (10YR 4/4) 20 percent rubbed color light brownish gray (2.5Y 6/2) sandy loam; weak fine and medium subangular blocky structure; friable, nonsticky, slightly plastic, common fine roots; many fine quartz grains; many fine black and white specks; strongly acid; clear wavy boundary. (3 to 5 inches thick)

C--15-60 inches; Light brownish gray (2.5 6/2) loamy sand; single grained; very friable, nonsticky, nonplastic, strongly acid.

TYPE LOCATION: Sur SCD, Puerto Rico; 100 meters north of kilometer marker 44.5 of Highway No. 10.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 11 to 20 inches. These soils are strongly or very strongly acid. Mean annual soil temperature ranges from 75 to 78 degrees F.

The A horizons are dark grayish brown (10YR 4/2), or dark brown (10YR 4/3). Clay loam is the dominant type.

The B horizons become lighter with depth and range from dark brown (10YR 4/3), to dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), pale brown (10YR 6/3), or light yellowish brown (10YR 6/4). The upper B horizons are loam or clay loam. The lower B horizons are sandy loam or loamy sand. Structure of the B horizons ranges from weak fine to weak medium subangular blocky inclusive. These soils have slightly sticky and slightly plastic A horizons and slightly sticky and plastic upper B horizons.

COMPETING SERIES: These are the Anones, Mayo, Pandura, Santa Marta, Utuado, Vieques, and Yunes series. The Anones and Santa Marta soils have oxidic mineralogy and fine texture. The Mayo soils are coarser textured throughout the solum. The Pandura soils are shallow to partially weathered plutonic rocks and are less acid. The Utuado soils have cooler soil temperatures and occur in higher elevations. The Vieques soils are drier having ustic soil moisture regimes. The Yunes soils are shallow to shaly sedimentary rocks and have 60 to 80 percent by volume of shaly fragments in the cambic horizon.

GEOGRAPHIC SETTING: The Pellejas soils occur on moderately steep and steep sideslopes and narrow ridges with slope gradients of 40 to 60 percent. The soil formed in coarse textured residuum weathered from plutonic rocks. The climate is humid tropical. The average annual precipitation ranges from 70 to 90 inches and the mean annual temperature is 76 to 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Lirios soils which occur in the sideslopes of the humid uplands. The Lirios soils have formed in the same kind of material, but are red, deeper to saprolite, and have argillic horizons.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained; very rapid runoff; rapid permeability.

USE AND VEGETATION: Mostly used for coffee and pasture.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Ponce Survey Area, Puerto Rico; 1971.

REMARKS: The Pellejas soils were formerly classified in the Gray Brown Podzolic great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION REILLY PR

Established Series
Rev. JLL/GRB
08/1999

REILLY SERIES

The Reilly series consists of very deep, excessively drained, rapid permeable soils on flood plains adjacent to streams. They formed in stratified sediments of gravel and sand. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 70 inches. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Sandy-skeletal, mixed, isohyperthermic Mollic Udifluvents

TYPICAL PEDON: Reilly gravelly loam - sugarcane. (Colors are for moist soil.)

Ap--0 to 9 inches; dark brown (10YR 3/3) gravelly silt loam; weak fine granular structure; friable; slightly sticky, nonplastic; many fine roots; moderately acid; abrupt smooth boundary. (7 to 16 inches thick)

C1--9 to 16 inches; dark grayish brown (10YR 4/2) very gravelly sand; massive; very friable; few fine roots; moderately acid, about 60 percent, by volume, pebbles; few thin silty and clayey layers; abrupt smooth boundary.

C2--16 to 48 inches; clean, coarse sand and gravel; about 70 percent, by volume, coarse gravel, 2 to 3 inches in diameter.

TYPE LOCATION: Suroeste SCD, San German Municipality, Puerto Rico. Approximately 1.0 miles northwest of the city of San German; from the intersection of P.R. Hwy. 102 and P.R. Hwy 347, about 490 feet north of P.R. Hwy. 347 on farm road, about 165 feet west of road in sugarcane field. San German topographic quadrangle; lat. 18 degrees 05 minutes 52 seconds N.; long. 67 degrees 02 minutes 43 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Thickness of the A horizon and depth to the sand and gravel ranges from 7 to 16 inches. Reaction ranges from very strongly acid to slightly acid throughout.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 and 3. Texture is loam, silt loam, or their gravelly analogs. Content of pebbles ranges from 25 to 35 percent, by volume.

The C horizon has hue of 10YR, value of 3 or 4, and value of 3 to 6. Texture is very gravelly sand or extremely gravelly sand. Content of pebbles ranges from 50 to 75 percent, by volume.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: The Reilly soils are on flood plains adjacent to streams. They formed in medium and moderately coarse-textured sediments stratified with gravel and sands in dominant proportions. Slope range from 0 to 2 percent. The climate is humid tropical. The average annual temperature ranges from 76 to 80 degrees F., and the average annual rainfall ranges from 65 to 75 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Bajura, Coloso, Dique, and Toa series. All of these soils are in flood plains. The poorly drained Bajura soils have more clay in the substratum. The somewhat poorly drained Coloso soils have more clay in the subsoil. The well drained Dique soils have more clay in the subsoil. The well drained Toa soils have more clay in the control section and have Mollic epipedons.

DRAINAGE AND PERMEABILITY: Excessively drained; rapid permeability.

USE AND VEGETATION: Most areas of Reilly soils are in pasture. A few small acreage are in vegetable crops or sugarcane. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Humacao Soil Survey Area, Puerto Rico; 1968.

MLRA: 272.

National Cooperative Soil Survey
U.S.A.

LOCATION RIO ARRIBA PR

Established Series
Rev. LHR
06/2002

RIO ARRIBA SERIES

The Rio Arriba series have brown, fine texture, plastic A horizons and yellowish brown, fine textured B2t horizons.

TAXONOMIC CLASS: Fine, mixed, subactive, isohyperthermic Vertic Paleudults

TYPICAL PEDON: Rio Arriba clay - sugarcane.
(Colors are for moist soil unless otherwise stated.)

Ap--0-8 inches; Brown (10YR 4/3) clay; weak coarse granular structure; hard, firm slightly sticky, plastic; many fine roots; neutral; clear smooth boundary. (4 to 10 inches thick)

B21t--8-16 inches; Yellowish brown (10YR 5/8) clay; moderate coarse prismatic breaking to weak medium subangular blocky structure with yellowish brown (10YR 5/4) thin continuous coatings on vertical surfaces of peds and patchy coatings on horizontal ped surfaces; hard, firm, slightly sticky, plastic; common fine roots; common fine black nodules; medium acid; clear smooth boundary. (6 to 12 inches thick)

B22t--16-28 inches; Yellowish brown (10YR 5/6) clay with common medium distinct yellowish red (5YR 4/6) mottles; weak coarse angular blocky with few slickensides and pressure faces; firm, slightly sticky, plastic, many fine black nodules; few fine roots; neutral; clear wavy boundary. (10 to 20 inches thick)

B23t--28-60 inches; Reddish yellow (7.5YR 6/6) clay with many medium distinct red (2.5YR 5/6) mottles; massive with few slickensides and pressure faces; firm, slightly sticky, plastic, many fine black nodules; mildly alkaline.

TYPE LOCATION: Turabo SCS, Puerto Rico; 0.4 kilometers west of the town of Gurabo on the Gurabo Experiment substation; 800 feet east of the western boundary of the farm and 600 feet north of the railroad tracks.

RANGE IN CHARACTERISTICS: Thickness of the solum is more than 60 inches. Base saturation at 50 inches below the top of the argillic horizon is 60 percent or more. The A horizon has colors in hues of 10YR or 7.5YR, values of more than 3 and chromas of 3 or 4. The B horizon has colors in hues of 10YR or 7.5YR, values of 4 through 6 and chromas of 4 through 8. Cracks occur at 20 inches and COLE values of 0.09 or more for more than 20 inches of B horizon. Fine clay content is higher in the B horizon than the A. The structure of the B horizon ranges from weak to moderate. Depth to the horizon with red mottles ranges from 20 to 42 inches. The soil ranges from medium acid through mildly alkaline.

COMPETING SERIES: These are the Fajardo, Juncal, Machete, San Sebastian, and Tanama series, all of which lack the .09 COLE value common to the VERTIC subgroups. The Fajardo soils are more acid, have gray mottles in the lower part. The Juncal soils have free carbonates in the lower profile. The San Sebastian soils have more than 50 percent limestone rock fragments in the profile. The Tanama soils have hard limestone rock within 20 inches of the surface.

GEOGRAPHIC SETTING: The Rio Arriba soils occur on gently to strongly sloping alluvial fans and terraces above the river flood plains. Slope gradients range from 2 to 12 percent. The soil formed in fine textured sediments of mixed origin. The climate is humid tropical. The average annual precipitation is 65 inches and the mean temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Caguabo, Gurabo, Juncos, Mabi, and Mucara series. The Caguabo, Gurabo, Juncos, Mabi, and Mucara soils lack argillic horizons and occur above the Rio Arriba soils in the landscape, with the exception of Guarabo and Mabi which occur at lower positions.

DRAINAGE AND PERMEABILITY: Moderately well drained, medium to rapid runoff; moderately slow permeability.

USE AND VEGETATION: Most of the acreage is in sugar cane and pasture.

DISTRIBUTION AND EXTENT: Humid inner valleys of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: These soils were formerly classified in the yellowish-brown Lateritic intergrading to the Grumusols great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION RIO PIEDRAS PR

Established Series
Rev. BCD
01/98

RIO PIEDRAS SERIES

The Rio Piedras series consists of very deep, moderately well drained, slowly permeable soils on dissected uplands. They formed in residuum from thin bedded siltstone and shale. Slopes range from 2 to 20 percent. The mean annual precipitation is about 80 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Hapludults

TYPICAL PEDON: Rio Piedras clay - sugarcane. (Colors are for moist soil)

Ap--O to 7 inches; reddish brown (5YR 4/4) moist, light reddish brown (5YR 6/4) dry; clay; moderate medium granular structure; hard, firm, slightly sticky, slightly plastic, many fine roots; extremely acid; clear smooth boundary. 6 to 8 inches thick.

Bt1--7 to 11 inches; yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few faint clay films; few fine roots; extremely acid, clear smooth boundary. 4 to 6 inches thick.

Bt2--11 to 21 inches; red (2.5YR 4/8) clay with many medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic, many prominent clay films on vertical and common distinct clay films on horizontal ped surfaces; few fine roots; few small siltstone fragments; extremely acid; clear smooth boundary. 8 to 12 inches thick.

Bt3--21 to 27 inches; red (2.5YR 5/6) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few faint clay films; many weathered and partially weathered shale fragments giving a yellow (10YR 7/6) mottled

appearance; common fine pores; extremely acid; gradual smooth boundary. 6 to 8 inches thick.

C--27 to 42 inches plus; highly weathered thin bedded siltstone, original platy structure clearly visible; variegated colors consisting of red, gray, and yellow, easily penetrated with auger.

TYPE LOCATION: Noroeste SCD, Puerto Rico; 2.5 kilometers east of the town of Aguada; 600 meters north of kilometer marker 134.0 of highway 2.

RANGE IN CHARACTERISTICS: These soils are extremely acid and clayey throughout. Thickness of the solum ranges from 24 to 34 inches. Thickness of the argillic horizons range from 18 to 26 inches. Depth to the hard bedded siltstone is over 3 feet. These soils are slightly sticky and slightly plastic throughout. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic. Organic matter content is 1.5 percent or less in the top 6 inches of the argillic horizon. CEC is more than 24 meq/100 grams of clay in the argillic horizon.

Colors of the A horizons have hues of 7.5YR and 5YR, values and chromas of 3 and 4.

The Bt horizons have colors in hues of 5YR, 2.5YR and 10R, values of 4 and 5 and chromas of 6 and 8. Structure ranges from moderate coarse to medium subangular blocky. Clay films vary from few faint to many prominent.

COMPETING SERIES: These are the Corozal, Consumo, Maricao, Lirios, Moca, Alonso, Ingenio, Jagueyes and Vega Alta series. The Corozal soils have low chroma mottles in the upper part of the argillic horizon. The Consumo, Maricao and Lirios soils have thinner argillic horizons. The Moca soils have clays with COLE values greater than 0.09. The Alonso, Ingenio, and Jagueyes soils have lower exchange capacity values. The Vega Alta soils have more than 5 percent nonindurated plinthite within 60 inches of the surface.

GEOGRAPHIC SETTING: The Rio Piedras soils occur on gently to strongly sloping sideslopes of dissected uplands with slope gradients from 2 to 20 percent. The regolith consists of fine textured residuum from thin bedded siltstone and shale. The climate is humid tropical. The average annual precipitation is 80 inches. The mean annual air temperature is 78 degrees F. The mean annual soil temperature at 20 inches is more than 71.6 degrees F with a difference less than 9 degrees F between mean summer and mean winter temperatures.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Moca series in addition to Plata, Yunes, Voladora, and Fajardo series. The Plata and Yunes soils are shallow and have cambic horizons. The Voladora soils have redder A and B horizons. The Fajardo soils are darker colored and have low chromas mottles.

DRAINAGE AND PERMEABILITY: Moderately well drained, runoff is medium, and permeability is slow.

USE AND VEGETATION: Sugarcane and pasture.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico, 1942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, kaolinitic, isohyperthermic Typic Tropudults to Clayey, kaolinitic, isohyperthermic Typic Hapludults. The previous OSED date was 2/67.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 7 inches (Ap horizon)

Argillic horizon - zone from 7 to 27 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION SABANA PR

Established Series
Rev. RAB: LHR
04/2000

SABANA SERIES

The Sabana series is a member of the clayey, mixed, isohyperthermic family of Lithic Dystropepts. These acid soils have thin, very dark gray, silty clay loam, A horizons and yellowish red, clay or silty clay B horizons, over hard volcanic rock.

TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic Lithic Dystrudepts

Ap--0 to 4 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium granular structure; firm, slightly sticky, slightly plastic; common fine roots; common fine volcanic fragments; strongly acid; clear wavy boundary. (2 to 6 inches thick)

B1--4 to 12 inches; dark grayish brown (10YR 4/2) silty clay; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine pores; few thin clay films; few fine volcanic rock fragments; strongly acid; clear smooth boundary. (4 to 8 inches thick)

B2--12 to 18 inches; yellowish red (5YR 5/6) clay; many coarse distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few fine roots; few fine pores; few thin patchy clay films; common fine volcanic rock fragments; strongly acid; abrupt smooth boundary. (4 to 8 inches thick)

R--18 to 21 inches plus; consolidated volcanic rock.

TYPE LOCATION: Este SCD, Puerto Rico; 1.5 miles from Highway 3 on Highway 925, 150 feet north of Parcelas Junquitos.

RANGE IN CHARACTERISTICS: Depth to the hard volcanic rock is from 10 to 20 inches. Base saturation is less than 50 percent in some part of the epipedon or cambic horizons. CEC is 24 or more meq/100 grams of clay in all horizons to the lithic contact. Reaction through the solum is strongly or very strongly acid.

The A horizon has colors of dark brown (7.5YR 3/2, 4/2; 10YR 3/3, 4/3), very dark gray (10YR 3/1), very dark grayish brown (10YR 4/2). Texture is silty clay loam or clay loam. Coarse fragments vary from few through common.

The B horizon has colors of dark yellowish brown (10YR 4/4) through brownish yellow (10YR 6/8), brown (7.5YR 4/4) through reddish yellow (7.5YR 6/8) or reddish brown (5YR 4/4) through reddish yellow (5YR 6/8). Texture of the B horizon is clay loam, silty clay loam, silty clay or clay. Clay films are thin and very patchy; they do not meet the requirements of an argillic horizon.

COMPETING SERIES: These are the Anones, Cramer, Descalabrado, Diamond, Malaya, Mariana, Pandura, Parcelas, Santa Marta, and Tanama series. The Anones, Mariana, and Santa Marta soils lack hard rock within 20 inches of the surface. Diamond and Descalabrado soils have dryer soil moisture regimes. Diamond and Pandura soils have loamy control sections. Cramer and Tanama soils have argillic horizons, and Cramer soils have mollic epipedons. Malaya soils have higher base saturation throughout the solum. Parcelas soils have sola thicker than 20 inches and lack the underlying rock.

GEOGRAPHIC SETTING: The Sabana soils occur on steep slopes with slope gradients from 20 to 60 percent. The regolith is thin, fine textured residuum of partially weathered volcanic rocks. The climate is humid tropical. The average annual rainfall is 80 to 90 inches. The mean annual temperature is 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Caguabo, Juncos, Mucara, and Naranjito series. The Caguabo soils are less acid and have coarser textured control sections. The Juncos and Mucara soils have montmorillonitic mineralogy and higher base saturation. Naranjito soils have argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to rapid. Permeability is moderate.

USE AND VEGETATION: The soils are used for pasture of mainly native grasses. Few small areas are used for minor crops.

DISTRIBUTION AND EXTENT: Humic volcanic uplands of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The Sabana series was placed in the Gray Brown Podzolic great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION SABANA SECA PR

Established Series
Rev. LHR:REG
07/2001

SABANA SECA SERIES

The Sabana Seca series consists of deep, poorly drained soils formed in iron rich sediments. They are gently sloping and sloping soils in the coastal plain. These soils are clay, plastic in the A horizon, clay, plastic, gleyed in the upper B horizon and are plinthic, gleyed in the lower B horizon.

TAXONOMIC CLASS: Very-fine, kaolinitic, isohyperthermic Plinthic Haplaquox

TYPICAL PEDON: Sabana Seca clay - pasture.
(Colors are for moist soil.)

Ap--0 to 10 inches; very dark grayish brown (10YR 3/2) clay; weak fine subangular blocky structure parting to weak fine granular; firm, slightly sticky, plastic; many fine roots; extremely acid; abrupt smooth boundary. (8 to 12 inches thick)

B1--10 to 13 inches; dark grayish brown (2.5Y 4/2) clay with many medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular and angular blocky structure; firm, slightly sticky, plastic, common fine roots; thin patchy clay films on ped faces; dark gray coloration (10YR 4/1) on old root channels and cracks; about 5 percent of Ap horizon; extremely acid; clear wavy boundary. (2 to 5 inches thick)

B21g--13 to 23 inches; light gray (5Y 6/1) clay with many coarse prominent yellowish brown (10YR 5/6) and few fine prominent red (10YR 4/6) mottles (1:1 ratio of matrix to mottles); very weak coarse prismatic structure parting to moderate medium subangular and angular blocky; firm, slightly sticky, plastic; common fine roots; thin patchy clay films on ped faces; dark gray (10YR 4/1) coloration on old root channels and ped faces; extremely acid; gradual smooth boundary. (7 to 13 inches thick)

B22g--23 to 36 inches; light gray (5Y 6/1, 7/1) clay with many fine to coarse strong brown (7.5YR 5/6) and common medium and coarse prominent dark red (10R 3/6) mottles, and a few specks of red (2.5YR 4/6); very weak coarse prismatic structure parting to moderate medium subangular and angular blocky; firm, slightly sticky, plastic; few fine roots, common fine perdigons (concretions); about 20 percent plinthite; thin patchy clay films on ped faces; extremely acid; gradual smooth boundary. (9 to 15 inches thick)

B23g--36 to 48 inches; white (5Y 8/1, 8/2) clay with many fine medium and coarse prominent dusky red (10R 3/4) and strong brown (7.5YR 5/6) mottles and concretions; weak coarse prismatic structure parting to weak medium subangular and angular blocky; firm, slightly sticky, plastic; about 25 percent plinthite; thin patchy clay films on vertical and horizontal ped faces; extremely acid; clear smooth boundary. (8 to 16 inches thick)

B24g--48 to 56 inches; white (5Y 8/1) clay with many coarse prominent dusky red (10R 3/4) and common fine to coarse prominent strong brown (7.5YR 5/8) mottles and concretions; weak coarse prismatic structure; firm, slightly sticky, plastic; about 20 percent plinthite; thin patchy clay films in vertical ped faces; extremely acid; clear smooth boundary. (8 to 16 inches thick)

B25g--56 to 70 inches; white (5Y 8/1) clay with many coarse prominent dusky red (10R 3/4) and dark red (7.5R 3/6) and few fine prominent red (10R 4/8) and strong brown (7.5YR 5/8) mottles and concretions; weak coarse prismatic structure; firm, slightly sticky, plastic; very few patchy clay films in vertical faces; about 25 percent plinthite; extremely acid.
TYPE LOCATION: San Juan, SCD, Puerto Rico, 400 meters east of kilometer marker 8.5 on highway 866, municipality of Toa Baja, San Juan Soil Survey Area.

RANGE IN CHARACTERISTICS: Thickness of the solum is over 60 inches. Thickness of the argillic is over 50 inches. Texture is clay throughout. Consistence is slightly sticky or sticky and plastic. Reaction is very strongly or extremely acid in the whole profile. Perdigons may or may not be present. Clay films are few or very few and patchy in the B horizon. Depth to water table ranges from 24 to 36 inches. CEC per 100 grams of clay ranges from 16 to 22 mc. Cation retention from NH4CC ranges from 9 to 12 mc. The mean annual soil temperature is 76 degrees F.

The A horizon has hues of 10YR and 2.5Y, values of 2 or 3 and chroma of 1 to 3. Structure is weak, fine or medium subangular blocky.

The B2g horizon has hues of 2.5Y and 5Y, values of 4 to 8, anc chromas of 1 and 2. Yellow, brown, strong brown, dusky red and dark red mottles are present in varying proportions. Low chromas occupies more than 60 percent of the matrix. Structure is weak, medium or coarse prismatic. Plinthite ranges from 15 to 30 percent in the lower B2g.

COMPETING SERIES: These are no other series in the same family. The Almirante, Guanajibo, Guerrero, Jobos, Sosa, Torres and Vega Alta series are similar soils in related families. The Almirante, Guanajibo, Jobos and Vega Alta soils are better drained. The Guerrero soils are better drained and have sandy surface layers. The Sosa soils have ustic moisture regimes. The Torres soils have sandy surface layers and higher organic content.

GEOGRAPHIC SETTING: The Sabana Seca soils are gently sloping and sloping soils in the coastal plains with slope gradients of 2 to 12 percent. The soil formed in fine textured, iron rich sediments of the coastal plains. The climate is humid tropical. The average annual precipitation ranges from 65 to 75 inches, and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Almirante, Martin Pena, Vega Alta, and Vega Baja series. The Almirante and Vega Alta soils are better drained and occupy slightly higher positions in the coastal plains. The Martin Pena soils are darker in color, lack plinthite and have organic surface layers. The Vega Baja soils are less acid and lack plinthite.

DRAINAGE AND PERMEABILITY: Poorly drained; slow runoff and very slow permeability.

USE AND VEGETATION: Native pasture and weeds used for pasture. Some of the acreage has been used for housing developments.

DISTRIBUTION AND EXTENT: Humid northern coastal plains of Puerto Rico. The series is of minor extent, with about 7,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

REMARKS:

ADDITIONAL DATA: Laboratory data are available for the typical pedon S58PR-9-1.

National Cooperative Soil Survey
U. S. A.

LOCATION SALADAR PR

Established Series
Rev. LHR
06/2002

SALADAR SERIES

The Saladar series consists of black, highly decomposed herbaceous materials. These soils have a high base status with pH of 7.4 on the surface and decreasing to 6.8 with depth.

TAXONOMIC CLASS: Euic, isohyperthermic Typic Haplosaprists

TYPICAL PEDON: Saladar muck.
(Colors are for moist soil unless otherwise stated.)

Oa1--0 to 10 inches; black (10YR 2/1) rubbed and pressed; about 30 percent fiber, about 15 percent rubbed; weak fine granular structure; nonsticky; mildly alkaline (pH 7.4 by Lamotte); gradual smooth boundary. (8 to 12 inches thick)

Oa2--10 to 35 inches; black (10YR 2/1), rubbed and pressed; about 25 percent fiber, about 10 percent rubbed; weak medium granular structure; nonsticky, neutral (pH 7.2 by Lamotte); gradual smooth boundary. (20 to 35 inches thick)

Oa3--35 to 51 inches; Black (10YR 2/1), rubbed and pressed; about 40 percent rubbed; massive; nonsticky, neutral (pH 6.8 by Lamotte).

TYPE LOCATION: San Juan, SCD, Cantano, Puerto Rico; 530 feet west of the corner of Dr. Joaquin Bosch Street and Dr. Colly Toste Street, Levittown Urbanization.

RANGE IN CHARACTERISTICS: The organic portion of the control section has colors in hues of 10YR or 7.5YR, values of 2 or 3, and chromas of 1 or 2. The value and/or chroma may increase 1 or 2 units when exposed to the air.

The surface tier (0 to 10 inches) exclusive of loose surface litter is composed of hemic and sapric materials with unrubbed fiber content that ranges from 20 to 30 percent of the organic volume. Rubbed fiber content is 10 to 15 percent. Structure of the surface tier ranges from weak to moderate fine granular.

The subsurface tier is dominated by sapric material. The unrubbed fiber content ranges from 15 to 25 percent of the organic volume and is 10 or less after rubbing. Fibers are chiefly herbaceous. Size of fibers are commonly 0.15 to 0.5 mm.

Thin layers of mineral materials may occur at any depth within the profile. Senses of sulfidic material may occur at depths lower than 60 inches. Water table is at or near the surface most of the year. The reaction of the profile ranges from 7.4 to 6.5 (by Lamotte method) and decreases with depth.

COMPETING SERIES: These are the Alakai and Kenner series. The Alakai soils have a mineral substratum, are more acid and have an isomesic soil temperature regime. Kenner soils have a thermic soil temperature regime.

GEOGRAPHIC SETTING: The Saladar soils occur in closed depressions, and coastal marshes with inadequate outlets. Slope gradients range from 0 to 2 percent. These soils have formed in thick deposits of almost completely decomposed herbaceous plant remains. The climate is humid tropical. The average annual rainfall is 80 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Martin Pena, and Bajura series, both of which are mineral soils and lack organic materials. They occupy slightly higher positions in the coastal lowlands.

DRAINAGE AND PERMEABILITY: Poorly drained; slow runoff; slow permeability.

USE AND VEGETATION: Natural vegetation consists of cattails, ferns, Para grass, sedges, morning glory, and other water loving plants. It is used as wildlife habitat.

DISTRIBUTION AND EXTENT: Humid coastal marshes of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The Saladar series was formerly classified in the Bogs great soil group.

National Cooperative Soil Survey
U.S.A.

LOCATION SOLLER PR

Established Series
Rev. LHR:REG
06/2002

SOLLER SERIES

The Soller series consists of moderately, deep, well drained soils formed in materials weathered from limestone. They are gently sloping to very steep soils on side slopes and hilltops in the humid limestone area. They are clay or clay loam, dark colored, calcareous in the A and B horizons over partially weathered limestone. Hard, fragmental limestone is at 26 inches.

TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic, shallow Typic Haprendolls

TYPICAL PEDON: Soller clay - pasture.
(Colors are for moist soil.)

Ap--0 to 5 inches; very dark gray (10YR 3/1) clay; weak fine and medium subangular blocky structure; firm, slightly sticky, plastic; many fine roots; moderately alkaline; clear smooth boundary. (4 to 6 inches thick)

B--5 to 12 inches; very dark grayish brown (10YR 3/2) clay; moderate coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; moderately alkaline; clear smooth boundary. (6 to 12 inches thick)

C--12 to 26 inches; white (10YR 8/1) partially weathered limestone that can be penetrated with the spade. (10 to 16 inches thick)

R--26 plus inches; hard fragmental limestone.

TYPE LOCATION: Culebrinas SCD, Puerto Rico; 4 miles west of the town of Laras; 350 meters north of kilometer

marker 28.45 on Highway 111.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 10 to 20 inches. Depth to the hard fragmental limestone varies from 20 to 34 inches. Some pedons have up to 30 percent cobbles in the surface. Reaction of the solum is neutral to moderately acid. It is slightly sticky or sticky and plastic. Calcium carbonate equivalent in the solum is more than 40 percent. The mean annual soil temperature ranges from 76 to 78 degrees F.

The A horizon has hues of 10YR, values of 2 or 3, and chromas of 1 or 2. Structure is weak fine or medium granular of subangular blocky.

The B horizon has hues of 10YR, values of 3 or 4, and chromas of 2 to 4. Structure ranges from weak medium to moderate coarse subangular blocky.

COMPETING SERIES: There are no other known series in the same family. The Aguilita, Binnsville, Castalia, Colinas, Fredensborg, Hesselberg, Otaway, Pedlar, Pozo Blanco, Redmanson, Sheege, Sion, Snowy, Tumbez, Tugur, Urtah, and Yauco. The Aguilita, Fredensborg, Hesselberg, Pozo Blanco, Sion, Tugur, and Yauco soils do not have cambic horizons and have ustic moisture regimes. The Binnsville, Castalia, Otaway, Redmanson, Sheege, Snowy, Tumbez and Urtah soils have colder soil temperatures and do not occur in the tropics. The Colinas soils have coarser textured sola and carbonatic mineralogy. The Pedlar soils have colder soil temperatures and havd hard rock within 20 inches.

GEOGRAPHIC SETTING: The Soller soils occur on gently sloping to very steep hilltops and side slopes of limestone hills with slope gradients of 2 to 60 percent. The regolith consists of fine textured residuum derived from limestone. The climate is humid tropical. The average annual precipitation ranges from 80 to 90 inches and the mean annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Santa Clara, Naranjo, and Colinas series in addition to the Canaguey series and the land type Limestone Outcrop. The Camaguey soils have thick A horizons, lack cambic horizons. and have slickensides and pressure phases. The land type Limestone Outcrops have 75 percent or more of the surface area covered by rock outcrops.

DRAINAGE AND PERMEABILITY: Well drained, runoff is medium to rapid and permeability is moderate.

USE AND VEGETATION: Native pasture and brushes.

DISTRIBUTION AND EXTENT: Humid limestone areas in the northern coastal plains of Puerto Rico. The series is of moderate extent, about 65,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

National Cooperative Soil Survey
U. S. A.

LOCATION TANAMA PR

Established Series
Rev. BCD
08/2000

TANAMA SERIES

The Tanama series consists of shallow, well drained, moderately permeable soils formed in materials weathered from limestone. They are gently sloping to very steep soils on foot slopes and side slopes of limestone hills. Slopes range from 2 to 60 percent. The mean annual precipitation is about 70 inches and the mean annual temperature is about 76 degrees F.

TAXONOMIC CLASS: Clayey, mixed, active, isohyperthermic Lithic Hapludalfs

TYPICAL PEDON: Tanama clay - sugarcane. (Colors are for moist soil.)

Ap--0 to 4 inches; dark reddish brown (5YR 3/4) clay; moderate fine and medium granular structure; firm, slightly sticky, plastic; many fine roots; common fine and medium limestone fragments; slightly acid; clear smooth boundary. (3 to 5 inches thick)

Bt1--4 to 11 inches; reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few faint clay films; slightly acid; abrupt wavy boundary. (5 to 9 inches thick)

Bt2--11 to 16 inches; reddish brown (5YR 5/4) clay with reddish brown (5YR 4/4) coatings in exterior of peds; moderate medium subangular blocky structure; firm, slightly sticky, plastic; common fine roots; few faint clay films; slightly acid. (4 to 6 inches thick)

R--16 inches; hard limestone.

TYPE LOCATION: Noroeste SCD, Puerto Rico; 2 miles southwest of the town of Aguada. 1.2 miles on dirt road west

of kilometer marker 24.9 on Highway 115 (old Highway 2).

RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the hard limestone ranges from 12 to 20 inches. Texture is clay in the whole profile. Consistence is slightly sticky and plastic throughout. Reaction ranges from slightly acid to neutral. The mean annual soil temperature is 75 degrees F.

The A horizon has hues of 5YR or 7.5YR, values and chromas of 3 or 4. Structure is weak or moderate, fine and medium granular.

The Bt horizon has hues of 5YR or 2.5YR, values of 3 or 5, and chromas of 4 to 6. Structure is moderate fine or medium subangular blocky. Clay films range from few faint to many distinct.

COMPETING SERIES: There are no other known series in the same family. The Caracoles, Islote, Juncal, Rio Lajas, San German, San Sebastian and Teja series are similar soils in related families. The Caracoles, San German, and Teja soils lack B horizons. The Islote soils are deeper to the calcareous sandstone. The Juncal soils have thicker argillic horizons. The Rio Lajas soils are sandy throughout. The San Sebastian are calcareous and have more than 35 percent coarse fragments in their profiles.

GEOGRAPHIC SETTING: The Tanama soils are gently sloping to very steep soils on foot slopes and side slopes of limestone hills with slope gradients of 2 to 60 percent. They formed in fine textured residuum derived from limestone. The climate is humid tropical. The average annual precipitation is 70 inches and the mean annual temperature is 76 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing San Sebastian and the San German series. The San Sebastian soils are deeper, very gravelly and calcarous. The San German soils are shallower, calcareous, and lack argillic horizon.

DRAINAGE AND PERMEABILITY: Well drained, medium to rapid runoff, and moderate permeability.

USE AND VEGETATION: Gentler slopes are in sugarcane. Steeper slopes are in pasture and brush. Small areas are in food crops.

DISTRIBUTION AND EXTENT: Along the north coastal plains of Puerto Rico. The series is of moderate extent, with about 75,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Lithic Tropudalfs to Clayey, mixed, isohyperthermic Lithic Hapludalfs. The previous OSED date was 11/75.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 4 inches (Ap horizon)

Argillic horizon - zone from 4 to 16 inches (Bt horizons)

Lithic contact - zone at 16 inches (R layer)

National Cooperative Soil Survey
U.S.A.

LOCATION TOA PR

Established Series
Rev. JLL/GRB
06/2002

TOA SERIES

The Toa series consists of very deep, well drained, moderately permeable soils are on river flood plains. They formed in stratified alluvial sediments of mixed origin. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 70 inches. Slopes range from 0 to 2 percent.

TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Fluvaquentic Hapludolls
TYPICAL PEDON: Toa silty clay loam - sugarcane. (Colors are for moist conditions.)

Ap--0 to 8 inches; dark brown (10YR 3/3) silty clay loam; weak fine granular structure; friable; slightly sticky, slightly plastic; common fine roots; many fine sand grains; about 3 percent, by volume, volcanic fragments 1/4 to 1/2 inch in diameter; strongly acid; clear smooth boundary.

A--8 to 17 inches; dark brown (10YR 3/3) silty clay loam; weak medium subangular blocky structure, parting to weak fine granular; friable; slightly sticky, slightly plastic; few fine roots; common fine black (10YR 2/1) nodules; neutral; clear smooth boundary. (Combined thickness of the Ap and A horizons ranges from 12 to 20 inches)

Bw--17 to 29 inches; dark yellowish brown (10YR 3/4) silty clay loam; weak medium and coarse subangular blocky parting to weak fine subangular blocky; friable; slightly sticky, slightly plastic; few fine roots, few fine vesicular pores, common fine black (10YR 2/1) nodules; few fine distinct dark brown (7.5YR 4/4) masses of iron accumulation; slightly alkaline; clear smooth boundary. (8 to 15 inches thick)

BC--29 to 43 inches; dark brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; few brick fragments found at the top of this horizon; few fine distinct reddish brown

(5YR 5/3) masses of iron accumulation; slightly alkaline; clear smooth boundary. (0 to 15 inches thick)

C--43 to 64 inches; dark yellowish brown (10YR 4/4) clay loam; massive; friable; slightly sticky, slightly plastic; few fine black (10YR 2/1) nodules; few fine faint yellowish brown (10YR 5/6) masses of iron accumulation; few fine faint light gray (10YR 7/1) areas of iron depletions; slightly alkaline.

TYPE LOCATION: Suroeste SCD, Puerto Rico. Approximately 0.9 mile southwest of the Lavadero community from the intersection of P.R. Hwy. 2 and P.R. Hwy. 345, about 2,300 feet south of P.R. Hwy. 345 on dirt road from the intersection of the highway at the kilometer marker 2.5, and about 650 feet east of road in sugarcane field. Rosario topographic quadrangle; lat. 18 degrees 07 minutes 31 seconds N., long. 67 degrees 06 minutes 47 seconds W.; PRD 1940.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 20 to 35 inches. Thickness of the mollic epipedon ranges from 12 to 20 inches. Reaction ranges from strongly acid to neutral in the Ap and A horizons, and from neutral to slightly alkaline in the Bw, BC, and C horizons. Organic carbon does not decrease regularly with depth. Fragments of volcanic rock ranges from 0 to 5 percent, by volume, throughout the profile.

The Ap or A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Texture is silty clay loam or silty clay. Fine volcanic fragments range from 0 to 5 percent, by volume.

The Bw horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown range from none to common.

The BC horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown range from none to common.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam or clay loam. Redoximorphic features in shades of brown and gray range from few to many. Texture is silty clay loam or clay loam. Lenses of sand may be present.

COMPETING SERIES: There are no other known series in the same family.

GEOGRAPHIC SETTING: Toa soils are on river flood plains. They formed in sediments of mixed origin. Slopes range from 0 to 2 percent. The climate is humid tropical. The average annual air temperature ranges from 77 to 79 degrees F., and the average annual precipitation ranges from 60 to 82 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the Bajura, Coloso, Dique, Reilly, and Vivi series. All of these soils are in flood plain positions. Bajura, Coloso, and Dique soils lack mollic epipedons. In addition, Bajura soils are poorly drained, Coloso soils are somewhat poorly drained, and Dique soils have fine-loamy control sections. The excessively drained Reilly soils have sandy-skeletal control sections. The somewhat excessively drained Vivi soils have coarse-loamy control sections.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most areas of Toa soils are used for the production of sugarcane. Some areas are in tame grasses and used for pasture. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

MLRA: 272, 273.

National Cooperative Soil Survey
U.S.A.

LOCATION TORRES PR

Established Series
Rev. LHR
06/2002

TORRES SERIES

The Torres series have very dark grayish brown and dark brown, thick, sandy, strongly acid A horizons, over thick, mottled, strongly acid coastal plains clays that contain more than 5 percent plinthite.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Plinthic Palehumults

TYPICAL PEDON: Torres loamy sand - pasture. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand; single grained; loose; nonsticky, nonplastic; common fine roots; few fine black concretions; strongly acid; gradual smooth boundary. (8 to 12 inches thick)

A11--10 to 21 inches; dark brown (10YR 3/3) loamy sand; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic, few fine roots; few fine black concretions; strongly acid; gradual smooth boundary. (8 to 14 inches thick)

A12--21 to 28 inches; dark brown (10YR 3/3) sandy loam; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; common fine black concretions; strongly acid; abrupt smooth boundary. (6 to 10 inches thick)

B21t--28 to 36 inches; yellowish brown (10YR 5/8) clay with few fine prominent red (10R 4/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; thin clay films along surfaces of peds; few sand sized quartz grains; strongly acid; gradual smooth boundary. (6 to 10 inches thick)

B22t--36 to 43 inches; yellowish brown (10YR 5/8) clay with common medium prominent red (10R 4/6) mottles;

moderate medium subangular blocky structure; firm, sticky, plastic; thin clay films on faces of peds; few sand sized quartz grains; strongly acid; gradual smooth boundary. (6 to 10 inches thick)

B23t 43 to 64 inches; yellowish brown (10YR 5/8) clay with common medium prominent dark red (10R 3/6) and few medium prominent light gray (5Y 7/1) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; thin continuous clay films on faces of peds; few fine quartz grains; strongly acid.

TYPE LOCATION: San Juan SCD, Puerto Rico, 0.15 miles on a dirt road south of kilometer marker 25.5 of highway No. 2, and 60 feet west of the dirt road.

RANGE IN CHARACTERISTICS: Thickness of the solum is over 60 inches. The soil is strongly or very strongly acid.

The A horizons have colors in hues of 10YR or 7.5 YR, values of 3, and chromas of 2 to 4 inclusive. They range from sand to sandy loam inclusive. Black concretions in these horizons have matrix colors in hues of 10YR, 7.5YR, or 5YR, values of 4 through 6, and chromas of 6 through 8. Mottles range from few to common, from fine to medium, and are red or dark red.

Gray mottles are usually in the lower B horizon. The B horizons are dominantly clay. Structure is moderate or strong subangular blocky and clay films are thin patchy or thin continuous.

COMPETING SERIES: These are the Aceitunas, Guanajibo, Guerrero, Jobos, Vega Alta, and Yunque series. The Aceitunas soils lack plinthite. The Guanajibo, Guerrero, Jobos, and Vega Alta soils have lower organic matter content in the upper B horizon. The Guanajibo, Jobos, and Vega Alta soils have thinner B horizons. The Yunque soils lack plinthite and have yellowish brown upper B colors and hues become redder with depth.

GEOGRAPHIC SETTING: The Torres soils occur in gently sloping coastal plains and trapped valleys among the haystack hills, on slope gradients of 2 to 5 percent. The soil formed in iron rich, fine textured sediments overlain by coarser textured sediments high in quartz grains. The climate is humid subtropical. The average annual precipitation varies from 60 to 80 inches and the mean annual temperature from 76 to 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Vega Alta and the Almirante, Bayamon, and Matanzas soils, all of which occur in the humid coastal plains. The Almirante soils lack the thick, dark sandy A horizons. The Bayamon and Matanzas soils have redder colors throughout and lower cation exchange capacity and lack the thick sandy surface layers.

DRAINAGE AND PERMEABILITY: Excessively drained; slow runoff; rapid permeability in the surface and moderate in the subsoil.

USE AND VEGETATION: Most of the acreage is in native pasture. Small areas are used for food crops.

DISTRIBUTION AND EXTENT: Humid coastal plains and valleys between limestone hills. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The Torres soils were formerly classified in the Reddish-Brown Lateritic great soil group. The concept of the series has been refined to comprise soils with plinthite and thick coarse textured surface horizons.

National Cooperative Soil Survey
U.S.A.

LOCATION VEGA ALTA PR

Established Series
Rev. BCD
06/2002

VEGA ALTA SERIES

The Vega Alta series consists of very deep, well drained, moderately permeable soils on coastal plains and terraces. They formed in clayey, iron-rich coastal plain sediments. Slopes range from 2 to 12 percent. The mean annual precipitation is about 76 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Fine, kaolinitic, isohyperthermic Typic Hapludults

TYPICAL PEDON: Vega Alta clay loam - marker grass. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches; dark yellowish brown (10YR 3/4) clay loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; many fine black concretions; common fine roots; strongly acid; abrupt wavy boundary. (6 to 10 inches thick)

Bt1--8 to 14 inches; reddish yellow (7.5YR 6/8) and yellowish red (5YR 4/6) clay; weak medium and coarse subangular blocky breaking to moderate fine granular structure with few faint clay films on surfaces of peds and root channels; firm, slightly sticky, slightly plastic; many fine black concretions; few fine roots; strongly acid; clear wavy boundary. (5 to 10 inches thick)

Bt2--14 to 25 inches; red (2.5YR 4/8) and strong brown (7.5YR 5/8) clay; moderate medium and coarse subangular blocky breaking to weak medium blocky structure with common prominent clay films on faces of peds; firm, slightly sticky, slightly plastic; few fine black concretions; few fine roots; strongly acid; gradual wavy boundary. (9 to 13 inches thick)

Bt3--25 to 36 inches; red (2.5YR 4/8) brownish yellow (10YR 6/8), and red (7.5R 4/8) clay; weak medium and coarse subangular blocky structure with brownish yellow clay films in root channels; firm, nonsticky, slightly plastic; few fine quartz grains; very strongly acid; gradual wavy boundary. (9 to 14 inches thick)

Bt4--36 to 52 inches; dark red (10R 3/6), strong brown (7.5R 5/8), and light gray (5Y 7/1) clay; weak coarse subangular blocky structure with few faint clay films; friable, nonsticky, slightly plastic; very strongly acid; gradual wavy boundary. (14 to 18 inches thick)

C--52 to 84 inches dark red (10YR 3/6), brownish yellow (10YR 6/8), light gray (5Y 7/1) clay; massive; friable, nonsticky, slightly plastic; very strongly acid.

TYPE LOCATION: San Juan SCD, Puerto Rico, Rio Piedras Experiment Station, section of farm north of Highway 1 to Caguas, 150 feet north of radio station, 50 feet south of trail, east of Rum Pilot Plant.

RANGE IN CHARACTERISTICS: Thickness of solum ranges from 43 to 65 inches and that of the Bt horizons from 37 to 55. Base saturation (by sum of cations) is less than 35 percent at 50 inches below the top of the argillic horizon. Exchange capacity in the major part of the argillic is less than 24 meq. per 100 grams of clay. Organic matter content is 1.5 percent or less in the upper 6 inches of the argillic horizon. Plinthite in the C horizon occupies more than 10 percent by volume of the soil mass.

The A horizon is clay loam or silty clay. Colors of the A horizon are in hues of 10YR or 7.5YR, values and chromas of 3 or 4.

The Bt horizons are dominantly clayey. They range from weak coarse to moderate medium subangular blocky and clay films range from few faint to many prominent. Black concretions in the profile range from few to many.

COMPETING SERIES: These are the Alonso, Consumo, Corozal, Ingenio, Jagueyes, Moca, and Rio Piedras series, none of which contain plinthite. The Alonso soils are reddish brown throughout. The Consumo soils have thinner argillic horizons. The Corozal soils have low chroma mottles in the upper B horizon. The Ingenio soils have many quartz sand size grains and have uniform red colors throughout. The Jagueyes soils are coarser textured. The Moca soils are underlain by clays with high shrink-swell behavior. The Rio Piedras soils have more developed argillic horizons and higher exchange

capacity.

GEOGRAPHIC SETTING: The Vega Alta soils occur on nearly level to moderately sloping coastal plains and terraces with slope gradients which range from 2 to 12 percent. The soil formed in fine textured, iron rich, red, brown, and gray coastal plains sediments. The climate is humid tropical. The mean annual precipitation is 76 inches and the mean annual temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bajura, Coloso, Toa, and Vega Baja, in addition to the competing Rio Piedras soils. The Bajura, Coloso, and Toa soils also occur at lower positions in the river flood plains. Bajura and Coloso soils are poorly drained and are dark grayish brown. Toa soils are well drained and are coarser textured. The Vega Baja soils are poorly drained and occur at slightly lower geomorphic terrace positions.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderate permeability.

USE AND VEGETATION: Used largely for production of sugar cane and for pasture.

DISTRIBUTION AND EXTENT: Humid northern coastal plains of Puerto Rico. This series is of limited extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; l942.

REMARKS: The classification was updated with the 4/91 draft from Clayey, mixed, isohyperthermic Plinthic Tropudults to Clayey, mixed, isohyperthermic Plinthic Paleudults. The previous OSED date was 7/73.

Laboratory data show that these soils have 10 percent or more weatherable minerals in the 20 to 200 micron fraction of the upper 40 inches.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 8 inches (Ap horizon)

Argillic horizon - zone from 8 to 52 inches (Bt horizons)

National Cooperative Soil Survey
U.S.A.

LOCATION VEGA BAJA PR

Established Series
Rev. RLV
06/2002

VEGA BAJA SERIES

The Vega Baja series consists of very deep, somewhat poorly drained, slowly permeable soils on alluvial fans and coastal plains. They formed in alluvial sediments and the underlying coastal plain sediments. Slopes range from 0 to 35 percent.

TAXONOMIC CLASS: Fine, mixed, active, isohyperthermic Aquic Hapludalfs

TYPICAL PEDON: Vega Baja silty clay - Merker grass. (Colors are for moist soil.)

Ap--0 to 7 inches; dark brown (10YR 4/3) silty clay; weak fine granular structure; firm, slightly sticky, plastic; many fine roots; few fine black concretions; strongly acid; gradual wavy boundary. (4 to 12 inches thick)

A--7 to 12 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) silty clay; weak fine granular structure; firm, slightly sticky, plastic; many fine roots; few fine black concretions; strongly acid; abrupt wavy boundary. (4 to 12 inches thick)

Bt1--12 to 17 inches; dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) clay; weak coarse subangular blocky structure; firm, slightly sticky, plastic; few fine roots; few fine black concretions; black coatings on ped faces and root channels; very strongly acid; abrupt wavy boundary. (4 to 10 inches thick)

Bt2--17 to 32 inches; mixed strong brown (7.5YR 5/8) and gray (5Y 6/1) clay; weak medium subangular blocky structure; firm, slightly sticky, plastic; seams between peds and root channels filled with gray clay; few fine black concretions; very strongly acid; gradual wavy boundary. (8 to 16 inches thick)

BC--32 to 50 inches; brownish yellow (10YR 6/8) and light gray (N 7/0) silty clay with pockets of yellowish brown clay loam materials; weak coarse subangular blocky structure; slightly sticky, slightly plastic; few peds and fracture planes coated with black; root channels and worm burrows filled with gray clay; strongly acid; abrupt wavy boundary. (12 to 20 inches thick)

C1--50 to 55 inches; light gray (N 7/0) clay with many fine distinct strong brown (7.5YR 5/8) mottles; massive; sticky, plastic; moderately acid; abrupt wavy boundary. (4 to 12 inches thick)

C2--55 to 60 inches; light gray (N 7/0) and strong brown (7.5YR 5/8) silty clay; massive; sticky, plastic; medium acid.

TYPE LOCATION: San Juan SCD, Puerto Rico, Rio Piedras Experiment Station 200 feet north on road to Food Technology Laboratory, and 200 feet to the east of road. (Section of farm north of Highway 1 to Caguas)

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 32 to 70 inches. Thickness of the argillic horizon varies from 24 to 46 inches. These soils are slightly sticky or sticky and plastic. Base saturation ranges from 40 to 80 percent at 50 inches below the top of the argillic horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 8. It is clay, silty clay or silty clay loam. Reaction ranges from neutral to very strongly acid.

The Bt horizon has hue of 7.5YR, 10YR, or 5Y, value of 4 to 6, and chroma of 1 to 8. They are clay or silty clay. Consistence is slightly sticky or sticky and plastic. Reaction is neutral or very strongly acid.

The C horizons are silty clay or clay; sticky and plastic. Reaction varies from moderately acid to strongly acid.

COMPETING SERIES: There are no series in this family. The Candelero, Cayagua, Coloso, Corcega and Talante series are similar soils in related families. The Candelero soils have coarser textured profiles with less than 35 percent clay. The Cayagua soils are underlain by coarse textured saprolite of granitic rocks within 40 inches of the soil surface. The Coloso soils lack argillic horizons and have organic matter that does not decrease regularly with depth. The Corcega and Talante are coarser textured.

GEOGRAPHIC SETTING: The Vega Baja soils are nearly level soils on fine textured coastal plains and alluvial fans with slope gradients from 0 to 35 percent. They formed in coastal plains sediments overlain by alluvial sediments. The climate is humid tropical. The mean annual precipitation ranges from 76 to 80 inches, and the mean annual air temperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Vega Alta, Sabana Seca, Coloso, Bajura and Toa series. The Vega Alta soils occur at higher elevations in the coastal plain, are well drained and have more than 5 percent plinthite in the B horizon. The Sabana Seca soils are poorly drained and have plinthite. The Coloso, Bajura, and Toa soils occur at lower geomorphic positions in the river flood plain. The Toa and Coloso soils have organic matter that does not decrease regularly with depth and the Bajura soils have horizons with COLE values of more than 0.09.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow runoff; slow permeability.

USE AND VEGETATION: Most of the acreage of this soil is used for the production of sugarcane, and tame grasses and used as pasture.

DISTRIBUTION AND EXTENT: Humid northern coastal plains of Puerto Rico. The series is of minor extent, about 2,100 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: This revision updates the classification to Aeric Endoaqualfs.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 12 inches (Ap and A horizon)

Argillic horizon - zone from 12 to 37 inches (Bt horizon)

ADDITIONAL DATA: Characterization data are available for the typical pedon S61-PR-9-1.

MLRA = 272

SIR = PR0059

National Cooperative Soil Survey
U.S.A.

LOCATION VIA PR

Established Series
Rev. BCD
08/2000

VIA SERIES

The Via series consists of very deep, well drained, moderately permeable soils on high stream terraces. They formed in stream sediments. Slopes range from 2 to 12 percent. The mean annual precipitation is about 75 inches and the mean annual temperature is about 78 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, semiactive, isohyperthermic Typic Paleudalfs

TYPICAL PEDON: Via silty clay loam - sugar cane. (Colors are for the moist soil.)

Ap--0 to 8 inches; dark grayish brown (10YR 4/2), brown (10YR 5/3) dry silty clay loam; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; common fine dark concretions; few worm casts; few cobbles and pebbles at contact with B horizon; extremely acid; abrupt smooth boundary. (6 to 14 inches thick)

Bt1--8 to 23 inches; reddish brown (5YR 4/4) clay loam; weak medium subangular blocky structure; very hard; firm, slightly sticky, slightly plastic; common fine roots; few faint clay films on vertical ped faces; many fine dark mineral grains; common fine rock fragments; slightly acid; clear smooth boundary. (10 to 16 inches thick)

Bt2--23 to 47 inches; yellowish red (5YR 4/8) clay loam; weak medium subangular blocky structure; very hard; firm, slightly sticky; slightly plastic; few fine roots; few faint clay films; common fine dark minerals; many fine and medium rock fragments; slightly acid; gradual wavy boundary. (14 to 30 inches thick)

2C--47 to 62 inches plus; dark brown (7.5YR 4/4) gravelly clay loam; structureless massive; hard, firm, slightly sticky; more than 70 percent by volume coarse fragments; medium acid.

TYPE LOCATION: Este SCD, Puerto Rico, municipality of Juncos; 0.43 miles west of kilometer marker 21.9 of Highway 3; 3,500 feet east of school house.

RANGE IN CHARACTERISTICS: Thickness of the solum and depth to the 2C gravelly horizons vary from 30 to 60 inches. Few to many rock fragments are found in the solum. Soil reaction ranges from extremely acid in the surface to slightly acid in the lower horizons. Mineralogy is mixed. Mean annual soil temperature at 20 inches depth is from 72 to 78 degrees F. and the difference between mean summer and mean winter soils temperatures is less than 9 degrees F. Base saturation (by sum of cations) is 35 percent or more at 50 inches from the top of the argillic horizon. These soils are usually moist and never dry for as long as 90 cumulative days in most years.

The A horizons have textures that range from silty clay loam to clay loam. The colors are in hues of 10YR to 5YR, values of 4 to 5, chromas of 2 to 4.

The Bt horizons have textures from silty clay loam to clay loam but are always less than 35 percent clay. Colors are in hues of 7.5YR and 5 YR, values of 4 to 6 and chromas of 4 to 8. Structure varies from weak medium to coarse subangular blocky. Clay films vary from few faint to common distinct.

Rock fragments in the 2C horizons vary from 50 to 80 percent by volume.

COMPETING SERIES: These are the San Sebastian, Juncal, Tanama, Rio Arriba, Amelia, Machete, Glynn and Fajardo series. The San Sebastian soils have more than 35 percent coarse fragments in their argillic horizons. The Juncal soils have more than 35 percent clay in their argillic horizons. The Tanama soils have hard rock within 20 inches of the surface. The Rio Arriba soils have subhorizons with more than 0.09 COLE values. The Amelia, Machete and Glynn soils have subhorizons that are dry for 90 cumulative days or more in most years. The Fajardo soils have argillic horizon that extend beyond 60 inches of the surface.

GEOGRAPHIC SETTING: The Via soils occur on gently to moderately sloping high stream terraces, with slope gradients from 2 to 12 percent. The regolith consists of moderately fine textured sediments underlaid by coarse textured gravelly or cobbly sediments. The climate is humid tropical. The average annual rainfall ranges from 70 to 80 inches and the average annual temperature is 78 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS. These are the Rio Arriba, Mabi, Junquitos, Mucara and Naranjito series. The Rio Arriba soils occur in similiar positions but have fine textured sola and mottled red fine textured parent materials. The Mabi soils occupy alluvial fan positions and have high COLE values. The Junquitos soils occupy footslopes and alluvial fan positions and have low chroma mottles in their profiles. The Mucara and Naranjito soils are on steep sideslopes and are underlaid by volcanic rock.

DRAINAGE AND PERMEABILITY: Well drained with medium runoff. Permeability is moderate.

USE AND VEGETATION: Cultivate areas are used for growing sugar cane. There are some areas in native and improved grasses and used as pasture.

DISTRIBUTION AND EXTENT. Humid sections of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

REMARKS: The classification was updated with the 4/91 draft from Fine-loamy, mixed, isohyperthermic Typic Tropudalfs to Fine-loamy, mixed, isohyperthermic Typic Paleudalfs. The previous OSED date was 1/69.

As originally mapped, the Via series contained moderately deep, aquic soils which are now classified in the Junquitos series.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 8 inches (Ap horizon)

Argillic horizon - zone from 8 to 47 inches (Bt horizons)

Pale clay curve - Less than 20 percent clay cutback in Bt and 2C horizons and value of 4 in Bt horizon.

National Cooperative Soil Survey
U.S.A.

LOCATION VIVI PR

Established Series
Rev. RAB-LHR-JEW
06/2002

VIVI SERIES

The Vivi series consists of deep, somewhat excessively drained soils formed in sediments derived from volcanic rocks. They are nearly level soils on river flood plains. These soils typically have very dark grayish brown loam A horizons and dark grayish brown loam B horizons over stratified very fine sandy loam to coarse sand C horizons. TAXONOMIC CLASS: Coarse-loamy, mixed, isohyperthermic Fluventic Hapludolls

TYPICAL PEDON: Vivi loam - cultivated sugar cane
(Colors are for moist soil.)

Ap--0 to 7 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; very friable, nonsticky, nonplastic; many fine roots; many fine quartz grains; strongly acid; clear smooth boundary. (5 to 10 inches thick)

B--7 to 14 inches; dark grayish brown (10YR 4/2) loam; weak coarse subangular blocky structure; friable, nonsticky, nonplastic; common fine roots; many fine quartz grains; medium acid; clear smooth boundary. (5 to 10 inches thick)

C1--14 to 20 inches; dark brown (10YR 3/3) very fine sandy loam; massive; friable; few fine roots; medium acid; clear smooth boundary. (6 to 12 inches thick)

C2--20 to 30 inches; very dark grayish brown (10YR 3/2) loam; massive; friable, nonsticky, nonplastic; many fine quartz grains; medium acid; clear smooth boundary. (8 to 14 inches thick)

C3--30 to 36 inches; dark grayish brown (10YR 4/2) coarse sand; single grain; loose; medium acid; clear smooth boundary. (5 to 10 inches thick)

C4--36 to 60 inches; dark grayish brown (10YR 4/2) sandy loam; common medium distinct brown (7.5YR 4/4) mottles; massive; very friable; medium acid.

TYPE LOCATION: Este SCD, Yabucoa, Puerto Rico; 1,000 feet north of kilometer marker 4.3 of Highway 901.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 10 to 20 inches. The soil ranges from strongly acid to slightly acid. Coarse fragment content ranges from 0 to 10 percent in subhorizons. The mean annual soil temperature ranges from 76 to 80 degrees F.

The A horizons have hues of 10YR or 2.5Y, values of 2 or 3, and chroma of 2 or 3. They are loam or sandy loam and have weak granular or subangular blocky structure.

The B horizons have hues of 10YR or 2.5Y, values of 3 to 6, and chroma of 2 to 4. They are loam or very fine sandy loam to sandy loam.

The C horizons have hues of 7.5YR to 2.5Y, values of 3 to 5, and chroma of 2 to 4. They are stratified loam or very fine sandy loam to coarse sand.

COMPETING SERIES: There are no other known series in the same family.

The Cornhill, Dique, Limani, Maraquez, Morado, Plata, and Vives series are similar soils in related families. Cornhill and Vives soils have ustic moisture regimes. Dique soils have fine-loamy particle-size control sections. Limani soils have base saturation of less than 50 percent. Maraquez, Morado, and Plata soils have regular decrease in organic matter with depth.
GEOGRAPHIC SETTING: The Vivi soils are nearly level on river flood plains. Slope gradients are 0 to 2 percent. The soils formed in coarse to medium textured stratified sediments from plutonic rocks. The climate is humid tropical. The average annual rainfall ranges from 80 to 90 inches. The mean annual temperature ranges from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Coloso, Maunabo, Mayo, Pandura, and Talante soils. Coloso, Maunabo, and Talante soils are somewhat poorly drained or poorly drained and have more than 18 percent clay in the particle-size control sections. Mayo soils have base saturation of less than 50 percent and are on terraces or alluvial fans above the flood plain. Pandura soils are shallow soils on uplands.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained. Runoff is medium to slow. Permeability is moderately rapid.

USE AND VEGETATION: Vivi soils are used for the production of sugar cane and minor crops. Some areas are used for growing pasture. Native vegetation consists of grasses and brush.

DISTRIBUTION AND EXTENT: Humid river flood plains of Puerto Rico. The series is of small extent with about 1600 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Puerto Rico; 1942.

REMARKS:

National Cooperative Soil Survey
U.S.A.

LOCATION YUNES PR

Established Series
Rev. LHR
06/2002

YUNES SERIES

The Yunes series consists of shallow, well drained soils formed in materials weathered from shale. They are steep to very steep soils on sideslopes of strongly dissected uplands. They have very shaly B horizons over bedded fractured shale at a depth of 10 to 20 inches.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, isohyperthermic, shallow Humic Dystrudepts

TYPICAL PEDON: Yunes silty clay loam - pasture
(Colors are for moist soil unless otherwise noted.)

A1--0 to 2 inches, dark reddish brown (5YR 3/2) silty clay loam, reddish gray (5YR 5/2) dry; moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; common fine shale fragments; strongly acid; clear smooth boundary. (1 to 4 inches thick)

B2--2 to 11 inches; dark brown (7.5YR 3/2) very shaly silty clay loam; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; 60 percent by volume of shale fragments; strongly acid; clear smooth boundary. (6 to 10 inches thick)

B3--11 to 16 inches; brown (7.5YR 4/4) very shaly silty clay loam; weak medium subangular blocky structure; friable, slightly sticky; slightly plastic; 80 percent by volume of shale fragments; strongly acid; clear smooth boundary. (3 to 6 inches thick)

Cr--16 inches; light red (2.5YR 6/8), strong brown (7.5YR 5/8), and pink (7.5 YR 7/4) bedded fractured shale;

thickness of beds is 1 to 4 inches. This material can be dug with difficulty with a spade, when moist.

TYPE LOCATION: San Juan SCD, Puerto Rico, Rio Piedras Experiment Station 50 feet south of kilometer marker 2.3, Highway 847.

RANGE IN CHARACTERISTICS: Solum thickness and depth to bedrock ranges from 10 to 20 inches. The solum has base saturation of 10 to 30 percent. The soil is very strongly acid or strongly acid. The mean annual soil temperature ranges from 76 to 79 degrees F.

The A horizon has hues of 5YR and 7.5YR, values of 2 and 3, and chroma of 2 or 3. It is silty clay loam and fine shale fragments range from 0 to 15 percent by volume.

The B horizon has hues of 5YR and 7.5YR, values of 3 and 4, and chroma of 2 to 4. It ranges from shaly clay loam to very shaly silty clay loam with 35 to 85 percent shale fragments.

COMPETING SERIES: These are no other known series in the same family.

The Adjuntos, Amones, Caguabo, Cuchillas, Descalabrado, Diamond, Juana Diaz, Malaya, Mariana, Mayo, Pandura, Parcelas, Pellejas, Sabana, Santa Marta, and Southgate series are similar soils in related families. Adjuntas, Amones, Mayo, Pellejas, and Santa Marta soils lack a paralithic contact within 20 inches of the soil surface. Caguabo, Malaya, and Pandura soils have base saturation of more than 50 percent. Cuchillas soils have isothermic temperature regimes and high content of organic matter. Descalabrado, Diamond, Juana Diaz, Mariana ,and Southgate soils have ustic soil moisture regimes. Parcelas soils have higher COLE values and crack when dry. Sabana soils have volcanic rock within a depth of 20 inches of the soil surface.

GEOGRAPHIC SETTING: The Yunes soils are steep to very steep soils on sideslopes of strongly dissected uplands. Slopes range from 20 to 60 percent. The soil developed in very shaly residuum from shale. The climate is humid tropical. The average annual precipitation is 76 inches. The average annual temperature ranges from 77 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: This is the Rio Piedras series. Rio Piedras soils have thick sola, argillic horizons, and lack shaly subhorizons.

DRAINAGE AND PERMEABILITY: Well drained, surface runoff is medium to rapid, and permeability is moderate in the A horizon and moderately rapid in the B horizon.

USE AND VEGETATION: Native grasses and shrubs.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of minor extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico, l942.

REMARKS:

National Cooperative Soil Survey
U.S.A.